

**WDD ARCHITECTS**  
5050 NORTHSHORE LN  
NORTH LITTLE ROCK, AR 72118

**WDD**  
ARCHITECTS



**BRINKLEY HIGH SCHOOL**

**BRINKLEY PUBLIC SCHOOLS**

**BRINKLEY, ARKANSAS**

**WDD PROJECT NO. 23-069**

**DBA PROJECT NO. 5002516**

**PACKAGE NO. 3**

**JANUARY 10, 2025**

**WITTENBERG, DELONY & DAVIDSON, INC.**  
5050 NORTHSHORE LN, NORTH LITTLE ROCK, ARKANSAS 72118  
(501) 376-6681

**Mechanical-Electrical Engineers**  
**INSIGHT ENGINEERING, PLLC**  
201 S CHESTER ST, LITTLE ROCK, ARKANSAS 72201

**Structural Engineers**  
**ENGINEERING CONSULTANTS, INC.**  
401 W CAPITOL AVE, STE 305, LITTLE ROCK, ARKANSAS 72205

**Civil Engineers**  
**MCCLELLAND CONSULTING ENGINEERS, INC.**  
7302 KANIS RD, LITTLE ROCK, ARKANSAS 72204

**Food Service Consultants**  
**MCKAY-LANE CONSULTING, INC.**  
1807 DODSON AVE, FORT SMITH, ARKANSAS 72901

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NEW BRINKLEY HIGH SCHOOL  
BUILDING PACKAGE NO. 3 (\*\*\*)  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS**

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## LEGAL ADVERTISEMENT

Proposals will be received on selected Bid Packages for the BRINKLEY HIGH SCHOOL PACKAGE NO. 3 for the BRINKLEY SCHOOL DISTRICT, BRINKLEY, ARKANSAS. The Construction Manager, Baldwin & Shell Construction Company, will receive bids at their offices located at 1000 WEST CAPITOL AVENUE, LITTLE ROCK, ARKANSAS on January 30, 2025, NO LATER THAN 2:00PM LOCAL TIME.

Once the time to receive bids has passed, bids received will be privately opened. Bids offered after the time to receive bids has passed will not be accepted.

Bidders are instructed to review SECTION 00 52 00 – BID PACKAGE SCHEDULE in the project manual and/or addenda for a complete description of Trade Contract & Material Supplier Packages.

ALL Bid Proposals must be submitted on a copy of the Bid Forms provided in the project manual or addenda. Bidders may photocopy these forms. The entire manual does not need to be submitted with the bids. Faxed and emailed Bid Package Proposals on Bid Forms will be accepted. Phone Quotes will not be accepted.

A 5% Bid Bond or Cashier's Check is required on Trade Contract bids in excess of \$50,000 and Material Supplier Contract bids in excess of \$100,000. Trade Contract Bids must include the cost of Performance Bond and Payment Bond. Successful Trade Contract bidders will be required to furnish the Performance Bond and Payment Bond on Baldwin and Shell standard bond forms without alteration. Material Supplier Contract bids in excess of \$100,000 must include the cost of a Supply Bond. Successful Material Supplier Contract bidders will be required to furnish the Supply Bond on Baldwin and Shell standard bond forms without alteration. All bidders shall meet Baldwin and Shell's Contract Requirements including execution of the attached Baldwin and Shell Standard Subcontract, Purchase Order, Grant Disclosure, Payment Bond, Performance Bond, Supply Bond and Baldwin and Shell Standard Form for Pay Application, and must comply with Baldwin and Shell's policies on Illegal Immigration.

Bidders shall conform to the requirements of the Arkansas licensing laws and regulations for contractors, and shall be licensed before a bid is submitted. Minority participation from firms is highly encouraged but not required.

Both the Owner and Construction Manager reserve the right to reject any and all bids, and to waive any formalities.

You may obtain Bid Documents electronically by contacting:

BALDWIN & SHELL CONSTRUCTION CO.  
CONSTRUCTION MANAGER  
1000 WEST CAPITOL AVENUE  
LITTLE ROCK, ARKANSAS 72201  
501-374-8677  
Ryan Engdahl CPE  
rengdahl@baldwinshell.com

BID FORM – TRADE CONTRACTOR PACKAGES

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

SECTION 00 41 00 – BID FORM – TRADE CONTRACTOR PACKAGES

NAME OF JOB: BRINKLEY HIGH SCHOOL PACKAGE NO. 3

BID PLACE: 1000 W. Capitol Avenue, Little Rock, AR 72201

BID DATE: January 30, 2025 @ 2:00PM Local Time

Proposal of:

---

NAME

---

ADDRESS

---

CITY, STATE, ZIP CODE

Hereinafter called “Bidder”

ARKANSAS CONTRACTOR’S LICENSE NO \_\_\_\_\_

FEDERAL TAX ID NO \_\_\_\_\_

TO: BALDWIN & SHELL CONSTRUCTION COMPANY  
1000 WEST CAPITOL AVENUE, LITTLE ROCK, AR 72201

Bids shall be privately reviewed and tabulated. The bid shall be based on the items and brands named on the Contract Documents:

The Undersigned, having carefully examined the Plans and Specifications, the General Conditions of the Contract and other related Baldwin and Shell Contract Documents and having made a thorough survey of the sites of the proposed work, satisfying themselves as to the conditions under which the work under this contract must be performed, hereby propose(s) to furnish all of the necessary labor, materials, and miscellaneous services called for in the Contract Documents, in the manner and under the conditions required as follows:

Bidder agrees to perform all of the work of the indicated Trade Contractor Package described in the Contract Documents, Specifications and shown on the plans for the complete Trade Contractor Package:

**Trade Contractor Package No.:** \_\_\_\_\_

**Trade Contractor Package Title:** \_\_\_\_\_

(See Bid Package Schedule for description of Trade Contract Packages)

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\_\_\_\_\_ (\$ \_\_\_\_\_ )  
DOLLARS

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

**PERFORMANCE AND PAYMENT BONDS**

For a Trade Contractor Package Bid Proposal Amount in excess of \$50,000.00 the Bidder agrees to provide a Performance Bond and Payment Bond executed on Baldwin and Shell’s Standard Forms without alteration and as described in the Project Manual for the following amount **included in the above Base Bid Proposal**: *(Insert N/A for Trade Contractor Package Proposal of less than \$50,000)*

\_\_\_\_\_ (\$ \_\_\_\_\_ )  
DOLLARS

**BID BONDS**

A 5% Bid Bond or Cashier’s Check is required on Trade Contract Package bids in excess of \$50,000.00.

The Bid security attached in the sum of:

\_\_\_\_\_ (\$ \_\_\_\_\_ )  
DOLLARS

is to become the property of the Construction Manager in the event the Contract and Bonds are not executed within the time set forth as liquidated damages for the delay and additional expense to the Owner caused thereby.

**ALTERNATES:**

The amount of the alternates below shall be the amount to add to or deduct from the base bid amount.

**Alternate No. 1: Trade Package Title:**

\_\_\_\_\_  
(See Bid Package Schedule for description of Trade Contract Packages)

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

**Alternate No. 2: Trade Package Title:**

\_\_\_\_\_  
(See Bid Package Schedule for description of Trade Contract Packages)

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

**Alternate No. 3: Trade Package Title:**

\_\_\_\_\_  
(See Bid Package Schedule for description of Trade Contract Packages)

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

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

**TRENCH SAFETY**

**Ark. Code Ann. § 22-9-212 requires the contractor to indicate on this bid form the cost of Trenching Safety Systems. (NOTE: THIS COST SHALL BE INCLUDED IN THE ABOVE BASE BID)**

\_\_\_\_\_ (\$ \_\_\_\_\_)  
DOLLARS

I, We acknowledge receipt of the following addenda:

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

I, We acknowledge our bid is based on all the project drawings and specifications:

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

Bidders hereby agree to commence work under this proposal on or before a date to be specified in a written notice to proceed from the Construction Manager.

The time for completion for the Base Bid is listed below:

**See Construction Manager’s Project Schedule.**

Bidder understands that the Construction Manager reserves the right to reject any or all bids and to waive any formalities in the bidding. The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute Baldwin and Shell’s Standard Subcontract Agreement without alteration within seven (7) days and deliver a Performance and Payment Bond on Baldwin and Shell’s standard Bond forms, without alteration, and as required by the General Conditions of the Contract.

BID FORM – TRADE CONTRACTOR PACKAGES

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

**Respectfully submitted:**

**Bidder:** \_\_\_\_\_

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

**By:** \_\_\_\_\_  
Authorized Company Officer Signature

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

**Business Address:** \_\_\_\_\_  
\_\_\_\_\_

Are you a WBE, MBE, SBE, DBE, DVBE, or HUB Owned Business? If Other, please list: \_\_\_\_\_  
Circle All That Apply

**Telephone Number:** (\_\_\_\_) \_\_\_\_\_

**Fax Number:** (\_\_\_\_) \_\_\_\_\_

**Email Address:** \_\_\_\_\_

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

TO: BRINKLEY SCHOOL DISTRICT

I, hereby state:

- (1) I am the duly authorized agent of \_\_\_\_\_ . The bidder submitting the competitive bid which is attached to this statement, for the purpose of certifying the facts pertaining to the existence of collusion among and between bidders and state officials, as well as facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the awarding of any contract pursuant to the bid to which this statement is attached.
- (2) I am fully aware of the facts and circumstances surrounding the making of the bid to which this statement is attached have been personally and directly involved in the proceeding leading to the submission of the bid.
- (3) Neither the bidder nor anyone subject to the bidder's direction or control has been a party:
  - (A) To any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding;
  - (B) To any collusion with any state official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of the prospective contract; or
  - (C) In any discussion between bidders and any state official concerning exchange of money or other thing of value of special consideration in the awarding of contract.

\_\_\_\_\_  
**Signature**

**Subscribed and sworn to before me this**  
\_\_\_\_\_ day of \_\_\_\_\_, 2025

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

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

The following information is provided to assist bidders in complying with various laws and rules governing the bidding. It represents most of the requirements, which are often overlooked, and therefore, the cause for rejection of bid. Use of this checklist in no way relieves the bidder from complying with all other laws, parts of laws, regulations and requirements of the Specifications. Prior to sealing and/or submitting Proposal, **check-off** these items for accuracy and completeness:

**ITEMS CHECKLIST**

Five percent (5%) Bid Bond enclosed, signed and made out to the Construction Manager. (A cashier's check or money order in the amount of 5% of the bid made out to the Construction Manager is permitted. Company or personal checks not acceptable.) This is only required if the bid is in excess of \$50,000.00.

Bid signed by Authorized Company Officer.

Addenda/addendum acknowledged.

Date of construction documents acknowledged.

Corrections initialed.

Contractor's license number furnished (if bid equals or exceeds \$50,000.00).

Project description, Trade Contractor Package name & number, and bidder's name on the outside of envelope.

Use proper bid form.

Bid must be delivered prior to bid opening time. If bid is mailed, allow sufficient time for mail delivery.

Non-collusion statement signed and notarized.

Alternates included where applicable.

Unit Prices included on Unit Price Bid Form where applicable.

END OF SECTION



BID FORM – MATERIAL SUPPLIER PACKAGES

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

SECTION 00 41 50 – BID FORM – MATERIAL SUPPLIER PACKAGES

NAME OF JOB: BRINKLEY HIGH SCHOOL PACKAGE NO. 3

BID PLACE: 1000 W. Capitol Avenue, Little Rock, AR 72201

BID DATE: January 30, 2025 @ 2:00PM Local Time

Proposal of:

\_\_\_\_\_  
(Hereinafter called “Bidder”), a Corporation organized and existing under the laws of the State of \_\_\_\_\_, a Partnership or an Individual doing business as:

\_\_\_\_\_  
NAME

\_\_\_\_\_  
ADDRESS

\_\_\_\_\_  
CITY, STATE, ZIP CODE

\_\_\_\_\_  
FEDERAL TAX ID NO

TO: BALDWIN & SHELL CONSTRUCTION COMPANY  
1000 WEST CAPITOL AVE., LITTLE ROCK, AR 72201

Bids shall be privately reviewed and tabulated. The bid shall be based on the items and brands named on the Contract Documents:

The Undersigned, having carefully examined the Plans and Specifications, the General Conditions of the Contract and other related Baldwin and Shell Contract Documents and having made a thorough survey of the sites of the proposed work, satisfying themselves as to the conditions under which the work under this contract must be performed, hereby propose(s) to furnish all of the necessary materials called for in the Contract Documents, in the manner and under the conditions required as follows:

Bidder agrees to supply all of the material of the indicated Material Supplier Package described in the Contract Documents, Specifications and shown on the plans for the complete Material Supplier Package:

**Material Supplier Package No.:** \_\_\_\_\_

**Material Supplier Package Title:** \_\_\_\_\_

(See Bid Package Schedule for description of Material Supplier Packages)

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

DOLLARS

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

**SUPPLY BOND**

For a Material Supplier Package Bid Proposal Amount in excess of \$100,000.00 the Bidder agrees to provide a Supply Bond executed on Baldwin and Shell’s Standard Forms without alteration and as described in the Project Manual for the following amount **included in the above Base Bid Proposal:** *(Insert N/A for Material Supplier Package Proposal less than \$100,000)*

\_\_\_\_\_ (\$ \_\_\_\_\_ )  
DOLLARS

**BID BONDS**

A 5% Bid Bond or Cashier’s Check is required on Material Supplier bids in excess of \$100,000.00.

The Bid security attached in the sum of:

\_\_\_\_\_ (\$ \_\_\_\_\_ )  
DOLLARS

is to become the property of the Construction Manager in the event the Contract and Bonds are not executed within the time set forth as liquidated damages for the delay and additional expense to the Owner caused thereby.

**ALTERNATES:**

The amount of the alternates below shall be the amount to add to or deduct from the base bid amount.

**Alternate No. 1: Material Supplier Package Title:**

(See Bid Package Schedule for description of Material Supplier Packages)

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

**Alternate No. 2: Material Supplier Package Title:**

(See Bid Package Schedule for description of Material Supplier Packages)

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

**Alternate No. 3: Material Supplier Package Title:**

(See Bid Package Schedule for description of Material Supplier Packages)

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

BID FORM – MATERIAL SUPPLIER PACKAGES

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

I, We acknowledge receipt of the following addenda:

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

I, We acknowledge our bid is based on all the project drawings and specifications:

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

Bidders hereby agree to commence work under this proposal on or before a date to be specified in a written notice to proceed from the Construction Manager.

The time for completion for the Base Bid is listed below:

**See Construction Manager's Project Schedule.**

Bidder understands that the Construction Manager reserves the right to reject any or all bids and to waive any formalities in the bidding. The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute Baldwin and Shell's Standard Purchase Order within seven (7) days and deliver a Supply Bond on Baldwin and Shell's standard Bond forms, without alteration, as required by the General Conditions of the Contract.

**Respectfully submitted:**

**Bidder:** \_\_\_\_\_

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

**By:** \_\_\_\_\_  
Authorized Company Officer Signature

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

**Business Address:** \_\_\_\_\_  
\_\_\_\_\_

Are you a WBE, MBE, SBE, DBE, DVBE, or HUB Owned Business? If Other, please list: \_\_\_\_\_  
Circle All That Apply

**Telephone Number:** (\_\_\_\_) \_\_\_\_\_

**Fax Number:** (\_\_\_\_) \_\_\_\_\_

**Email Address:** \_\_\_\_\_

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

TO: BRINKLEY SCHOOL DISTRICT

I, hereby state:

- (1) I am the duly authorized agent of \_\_\_\_\_ . The bidder submitting the competitive bid which is attached to this statement, for the purpose of certifying the facts pertaining to the existence of collusion among and between bidders and state officials, as well as facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the awarding of any contract pursuant to the bid to which this statement is attached.
- (2) I am fully aware of the facts and circumstances surrounding the making of the bid to which this statement is attached have been personally and directly involved in the proceeding leading to the submission of the bid.
- (3) Neither the bidder nor anyone subject to the bidder's direction or control has been a party:
  - (A) To any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding;
  - (B) To any collusion with any state official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of the prospective contract; or
  - (C) In any discussion between bidders and any state official concerning exchange of money or other thing of value of special consideration in the awarding of contract.

\_\_\_\_\_  
**Signature**

**Subscribed and sworn to before me this**  
\_\_\_\_\_ day of \_\_\_\_\_, 2025

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

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

The following information is provided to assist bidders in complying with various laws and rules governing the bidding. It represents most of the requirements, which are often overlooked, and therefore, the cause for rejection of bid. Use of this checklist in no way relieves the bidder from complying with all other laws, parts of laws, regulations and requirements of the Specifications. Prior to sealing and/or submitting Proposal, **check-off** these items for accuracy and completeness:

**ITEMS CHECKLIST**

Five percent (5%) Bid Bond enclosed, signed and made out to the Construction Manager. (A cashier's check or money order in the amount of 5% of the bid made out to the Construction Manager is permitted. Company or personal checks not acceptable.) This is only required if the bid is in excess of \$100,000.00.

Bid signed by Authorized Company Officer.

Addenda/addendum acknowledged.

Date of construction documents acknowledged.

Corrections initialed.

Project description, Material Supplier Package name & number, and bidder's name on the outside of envelope.

Use proper bid form.

Bid must be delivered prior to bid opening time. If bid is mailed, allow sufficient time for mail delivery.

Non-collusion statement signed and notarized.

Alternates included where applicable.

END OF SECTION

UNIT PRICES BID FORM

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

SECTION 00 42 00 – UNIT PRICES BID FORM (ATTACHMENT TO THE TRADE CONTRACTOR’S BID FORM)

UNIT PRICES

The Undersigned agrees that the following UNIT PRICES shall govern changes in the Work, whether they are ADDITIONS or DEDUCTIONS to the Contract Sum required during the course of the work. Unit Prices shall be the same for Additions or Deductions. All Unit Prices shall be total installed costs including overhead, profit, Geotechnical engineering and all other necessary costs. Proposing separate add and deduct unit prices shall subject this Bid Proposal to being rejected as “non-responsive”.

ITEM & UNIT OF MEASURE

ADDITION or DEDUCTION  
(Enter one price only)

MASS UNDERCUT (Export):

- 1. Unsuitable material below finished sub grade removed and disposed of offsite per cu. yd.

INCLUDED WITH PACKAGE 2

TRENCH UNDERCUT:

- 2. Unsuitable material below finished utility trench sub grade removed and disposed of offsite per cu. yd.

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

FOOTINGS UNDERCUT:

- 3. Unsuitable material below finished concrete slab trench sub grade removed and disposed of offsite per cu. yd.

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

STRUCTURAL FILL (Import):

- 4. Structural Fill backfilled with specified material per cu. yd.

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

STONE BACKFILL:

- 5. Stone Backfill with specified material per cu. yd.

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

LEAN CONCRETE BACKFILL:

- 6. Lean Concrete Backfill with specified material per cu. yd.

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

UNIT PRICES BID FORM

BRINKLEY HIGH SCHOOL PACKAGE NO. 3  
BRINKLEY SCHOOL DISTRICT  
BRINKLEY, ARKANSAS

MASS ROCK EXCAVATION:

7. Remove Mass Rock as further defined in these specifications per cu. yd.

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

TRENCH ROCK EXCAVATION:

8. Remove Rock from trench as further defined in these specifications per cu. yd.

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

HYDROMULCHING:

9. Hydromulching as further defined in these specifications per sq. yd.

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

**Respectfully submitted:**

**Bidder:** \_\_\_\_\_

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

**By:** \_\_\_\_\_  
Authorized Company Officer Signature

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

**Business Address:** \_\_\_\_\_  
\_\_\_\_\_

Are you a WBE, MBE, SBE, DBE, DVBE, or HUB Owned Business? If Other, please list: \_\_\_\_\_  
Circle All That Apply

**Telephone Number:** (\_\_\_\_) \_\_\_\_\_

**Fax Number:** (\_\_\_\_) \_\_\_\_\_

**Email Address:** \_\_\_\_\_

(SEAL)  
(If Bid is by a Corporation)

END OF DOCUMENT

Project # «Project»

«SubcontractNumber»

## SUBCONTRACT

DATE: «DateOfSubcontract»

SUBCONTRACT#: «SubcontractNumber»

This AGREEMENT is by and between

**CONTRACTOR:** Baldwin & Shell Construction Co.  
«BSFirmName»  
«BSMailAddress»  
«BSMailCity», «BSMailState» «BSMailZip»

and

**SUBCONTRACTOR:** «FirmName»  
«FirmAddress»  
«FirmCity», «FirmState» «FirmZip»

**SUBCONTRACTOR CONTACT:** «ContactFName» «ContactLName»  
**Phone:** «FirmPhone»  
**Fax:** «FirmFax»  
**Cell:** «MobilePhone»  
**Email:** «EMail»

**FEDERAL ID NO:** «FederalIDnumber»

**PROJECT:** «CompleteProjDescription»

**LOCATION:** «JobShipAddress»  
«JobShipCity», «JobShipState» «JobShipZip»

**OWNER:** «Owner»  
**OWNER REP:** «OwnerContact»

**ARCHITECT/ENGINEER:** «ArchEngName»  
«ArchEngShipAddress1»  
«ArchEngShipCity», «ArchEngShipState» «ArchEngShipZip»

**Architects Project No.** «ArchProjectNumber»

**DATE OF GENERAL CONTRACT WITH OWNER:** «OwnerContractDate»

### ARTICLE 1 THE CONTRACT DOCUMENTS

- 1.1 The Contract Documents for this Subcontract consist of this Agreement and any attached Exhibits, the Drawings and Specifications for the Project, the General and Supplementary Conditions, Addenda and all other documents constituting the agreement between the Contractor and the



Owner (the "General Contract"), all of which have been furnished to and carefully reviewed by the Subcontractor. The Contract Documents shall not include any proposals, correspondence or agreements dated, made or alleged to have been made prior to the date of this Subcontract unless specifically incorporated in writing.

- 1.2 Subcontractor shall be bound to the Contractor by the terms of the General Contract **including without limitation any terms relating to indemnification, dispute resolution, forum selection, no damages for delay, liquidated damages, termination, or payment.** **Subcontractor** shall conform to and comply with the provisions of the General Contract, furnish such shop drawings, submittals or samples as may be required, and assume toward the Contractor all the obligations and responsibilities that the Contractor assumes in and by the General Contract with the Owner, insofar as they are applicable to this Subcontract.

ARTICLE 2  
THE WORK

- 2.1 Subcontractor shall furnish all labor, material, supervision, equipment, temporary storage, insurance, taxes, fees and permits necessary to complete the Work described below.

«SLNotes»

- 2.2 Subcontractor is an independent contractor. The Subcontractor is solely responsible for, and has control over, all construction means, methods, techniques, sequences, procedures, and coordination of all portions of the Work, unless the Contractor gives specific written instructions concerning such. Subcontractor shall continually stay informed of the conditions and progress of the Project and immediately notify Contractor and other subcontractors of any conditions or work under this Subcontract that might interfere with work performed by other subcontractors. All work shall be performed by skilled and reputable workmen and subject to approval and acceptance of the Architect/Engineer, Contractor and Owner. Subcontractor shall provide a schedule of all anticipated material and equipment purchases with estimated delivery dates within **FOURTEEN (14) DAYS** of execution of this Agreement for approval by Contractor. **NO WORK SHALL BE PERFORMED UNTIL ALL CONTRACT DOCUMENTS HAVE BEEN EXECUTED AND CERTIFICATES OF INSURANCE, BONDS, ILLEGAL IMMIGRANT DISCLOSURE CERTIFICATION, SEX OFFENDER DISCLOSURE CERTIFICATION, APPLICABLE GRANT DISCLOSURES AND SAFETY PROGRAMS HAVE BEEN RECEIVED AND APPROVED.**

- 2.3 Subcontractor shall furnish all necessary shop drawings, samples and other submittal documentation to the following individual and address:

«LocationToSendSubmittals»

Attn: «ProjectManager»

Phone: «PMPhone»

Fax: «PMFax»

Cell: «PMCell»

Email: «PMEMail»

All submittals are due within thirty (30) days of execution of this Subcontract.

- 2.4 Subcontractor may submit all required contract documents, i.e., executed subcontracts, certificates of insurance, safety programs, bonds, illegal immigrant, and sex offender disclosures certifications when required via email to [compliance@baldwinshell.com](mailto:compliance@baldwinshell.com).

ARTICLE 3  
TIME OF PERFORMANCE

- 3.1 Time is of the essence of this Subcontract so the entire Project shall be completed in accordance with the Contract Documents and the Project Schedule as set forth in **Exhibit "SCH01"** or, in the absence of such Exhibit, on or before **«ProjectCompletionDate»**. Either of such schedules may be revised by the Contractor from time to time, in its sole discretion. Subcontractor agrees to begin the Work as soon as the Project is ready for such Work or, in any event, within five (5) days after being notified by Contractor to proceed. Subcontractor shall diligently and continuously prosecute and complete the Work in cooperation and coordination with the other work being performed on the Project, and in such time, order and manner as directed by Contractor and in accordance with the Project Schedule so as not to delay the commencement, progress, or completion of the Work or of the Project. Furthermore, Subcontractor will provide sufficient manpower including any overtime required to maintain the Project Schedule at no additional charge unless the necessity for overtime is caused by others failing to maintain their schedule through no fault of this Subcontractor or circumstance beyond the control of this Subcontractor (such as "acts of God").
- 3.2 In agreeing to perform the Work in accordance herewith, Subcontractor has taken into account and has made allowances for delays which should be reasonably anticipated or foreseeable.
- 3.3 **IF THE SUBCONTRACTOR IS PREVENTED FROM COMPLETING ANY PART OF ITS WORK DUE TO DELAY BEYOND ITS CONTROL, ITS CONTRACT TIME WILL BE EXTENDED IN AN AMOUNT EQUAL TO THE TIME LOST DUE TO SUCH DELAY IF THE SUBCONTRACTOR COMPLIES WITH THE NOTICE PROVISION OF PARAGRAPH 3.4. DELAYS BEYOND THE CONTROL OF THE SUBCONTRACTOR INCLUDE, BUT ARE NOT LIMITED TO, ACTS OR NEGLIGENCE BY OWNER, CONTRACTOR OR OTHER SUBCONTRACTORS, FIRES, FLOODS, EPIDEMICS OR PANDEMICS, ABNORMAL WEATHER CONDITIONS, OR ACTS OF GOD. THE EXTENSION OF TIME FOR DELAY BEYOND THE CONTROL OF SUBCONTRACTOR SHALL BE SUBCONTRACTOR'S SOLE AND EXCLUSIVE REMEDY FOR SUCH DELAY IF CAUSED BY OWNER OR ANOTHER SUBCONTRACTOR (UNLESS CONTRACTOR ACTUALLY RECOVERS SUCH DAMAGES ON BEHALF OF SUBCONTRACTOR). IN NO EVENT SHALL CONTRACTOR BE LIABLE TO SUBCONTRACTOR FOR DELAYS CAUSED BY OR WITHIN THE CONTROL OF SUBCONTRACTOR, OR DELAYS BEYOND THE CONTROL OF BOTH CONTRACTOR AND SUBCONTRACTOR, INCLUDING BUT NOT LIMITED TO FIRES, FLOODS, EPIDEMICS, ABNORMAL WEATHER CONDITIONS, OR ACTS OF GOD. NOTHING IN THIS PARAGRAPH BARS A CHANGE IN CONTRACT PRICE PURSUANT TO ARTICLE 9 TO COMPENSATE SUBCONTRACTOR DUE TO DELAY, INTERFERENCE, OR DISRUPTION DIRECTLY ATTRIBUTABLE TO THE ACTIONS OR INACTIONS OF THE CONTRACTOR, BUT IN NO EVENT SHALL CONTRACTOR BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES, WHICH SUBCONTRACTOR WAIVES. CONSEQUENTIAL DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, PRINCIPAL OFFICE EXPENSES AND PERSONNEL COMPENSATION, LOSS OF BUSINESS OR FINANCING, LOSS OF PROFIT, AND IMPACT TO REPUTATION.**
- 3.4 Subcontractor shall provide written notification to Contractor of any event for which compensation is sought under paragraph 3.3 within **FIVE (5) DAYS** from the time such event begins.
- 3.5 Because time is of the essence, Subcontractor shall reimburse, defend and indemnify Contractor for any liquidated or actual damages that may be asserted against, assessed against or incurred by Contractor which are attributable to or caused in whole or in part by Subcontractor's failure to perform the Work required by this Subcontract within the time fixed or in the manner provided for in this Subcontract. Liquidated or actual damages, when assessed, shall not exceed Subcontractor's proportionate share of the responsibility for such liquidated or actual damages. This paragraph shall survive any abandonment by or termination of this Subcontract.

ARTICLE 4  
THE CONTRACT PRICE

- 4.1 The Contractor agrees to pay the Subcontractor for the performance of the Work as indicated below:

Item	Phase	Description	Qty	UM	Unit Price	Extended Price
«Item»	«JobPhase»	«Description»	«Quar	«UnitofMeas	«UnitPrice»	\$«ExtendedPrice»

in current funds, subject to additions and deductions for changes as may be agreed upon in writing.

- 4.2 The Contract Price includes all taxes now levied or hereafter imposed on any tangible personal property sold or transferred to the Contractor under this Subcontract, and the Subcontractor agrees to pay such taxes. The Subcontractor is exclusively liable for and shall pay any tax, assessment, or contribution for Unemployment Insurance or Social Security Tax levied by the Federal or any State government on the salaries or wages of all persons employed by the Subcontractor and the Subcontractor agrees to comply with all the rules, regulations and requirements of any Federal and/or State Agency or Commission having jurisdiction thereof.

ARTICLE 5  
PAYMENT

- 5.1 Prior to submittal of the first billing, Subcontractor shall submit a Schedule of Values electronically **Exhibit "SOV01"** to the Project Manager providing a complete breakdown of the costs of the work performed under this Agreement for approval by the Contractor.
- 5.2 Subcontractor shall submit Payment Application **Exhibit "PA01"** to the Contractor's corporate address of:

**P.O. Box 1750**  
**Little Rock, Arkansas 72203**  
**Or**  
[invoices@baldwinshell.com](mailto:invoices@baldwinshell.com)

by the «BillDay» day of the month. When emailing billings Subcontractor shall reference the Job # and Subcontract # in the subject line of the email. The billing shall be for all Work accomplished up to that date, less the aggregate of all previous payments. The Subcontractor shall calculate and deduct a retained percentage of «Retainage» to arrive at the net invoice amount. If billings are not received by the stated date, payment will not be made until the second month following receipt. If payments are made on account of materials not incorporated in the work but delivered and suitably stored at the site, or at some other location agreed upon in writing, such payments shall be in accordance with the terms and conditions of the Contract Documents. Payment shall be predicated upon a Certificate of Insurance as per Article VII. If materials stored offsite are eligible for payment, a Certificate of Insurance will be required. The Certificate must list the location where the materials are stored, a description of stored materials, the job for which the materials are stored, the monetary value of the stored materials, and show Baldwin & Shell Construction Company as the named insured. **NO PAYMENTS WILL BE ISSUED UNTIL SCHEDULE OF VALUES (Exhibit "SOV01") IS RECEIVED AND APPROVED IN THE CORPORATE OFFICE.**

- 5.3 Before issuance of any payment, the Subcontractor, if required, shall identify in writing, and submit waivers of lien from, each supplier or sub-subcontractor of Subcontractor, or provide evidence satisfactory to the Contractor that all payrolls, material bills, and all known indebtedness connected with the Work have been satisfied, or both of the above.

Final payment, constituting the entire unpaid balance of the Contract Price, shall be made by the Contractor to the Subcontractor when the Work is fully performed in accordance with the requirements of the Contract Documents, final close out documents are received and approved, the Architect/Engineer has issued a certificate for payment covering the Subcontractor's completed work, and the Contractor has received payment from the Owner. No claims for additional compensation in excess of Contract Price shall be accepted after issuance of final payment.

- 5.4 **SUBCONTRACTOR ACCEPTS THE RISK OF NON-PAYMENT IF OWNER DOES NOT PAY FOR WORK INCLUDED IN SUBCONTRACTOR'S MONTHLY APPLICATIONS OR MAKE FINAL PAYMENT TO CONTRACTOR. OWNER'S PAYMENT TO CONTRACTOR OF SUCH FUNDS IS A CONDITION PRECEDENT TO ANY OBLIGATION OF CONTRACTOR TO PAY SUBCONTRACTOR.**
- 5.5 Progress payments or final payment may be withheld by Contractor on account of defective work not remedied, claims filed, reasonable evidence indicating the probability of the filing of claims or reasonable doubt that the Subcontract can be completed for the balance of the Subcontract amounts then unpaid or within the time under the Project Schedule. **Contractor may offset against any sums due Subcontractor hereunder the amount of any liquidated and unliquidated obligations of Subcontractor to Contractor, whether or not arising out of this Subcontract or another subcontract or other obligation.**
- 5.6 In its sole discretion, Contractor may pay the Subcontractor by joint check payable to it and any of its sub-subcontractors or suppliers to either Subcontractor or sub-subcontractors. Requests by Subcontractors to issue joint checks will be considered. Contractor assumes no liability for failure to perform this service to Subcontractor.

#### ARTICLE 6

##### PERFORMANCE AND PAYMENT BONDS

- 6.1 If applicable, the cost of a 100% Performance Bond and 100% Payment Bond is included in the Contract Price. Subcontractor shall furnish Subcontract Performance Bond and Subcontract Payment Bond on the Contractor's bond forms which are attached as **Exhibits "SCPERF01 & SCPMT01"**. The bonds shall be issued by a surety acceptable to Contractor. No payments will be processed until properly executed bonds have been received by the Contractor, who also reserves the right to terminate this Subcontract if such bonds are not furnished. **NO OTHER BOND FORMS WILL BE ACCEPTED. ALL BONDS SHALL BE ADJUSTED BY RIDER FOR ADDITIVE CHANGE ORDERS. NO DEDUCTIVE BOND RIDER WILL BE ACCEPTED FOR DEDUCTIVE CHANGE ORDERS UNLESS APPROVED BY CONTRACTOR.**

#### ARTICLE 7

##### INDEMNITY, INSURANCE AND WAIVER OF SUBROGATION

- 7.1 **TO THE FULLEST EXTENT PERMITTED BY LAW, SUBCONTRACTOR SHALL INDEMNIFY, HOLD HARMLESS AND DEFEND CONTRACTOR, ARCHITECT, AND OWNER, TOGETHER WITH THEIR AGENTS, SERVANTS, EMPLOYEES, REPRESENTATIVES, OFFICERS, DIRECTORS OR THEIR HEIRS, AND SURETIES, FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, ATTORNEYS' FEES, AND CAUSES OF ACTION ARISING OUT OF OR RESULTING FROM THE FAILURE OF SUBCONTRACTOR TO PERFORM ITS CONTRACTUAL OBLIGATIONS OR SATISFY ANY STATUTORY OR COMMON LAW DUTIES. THIS INDEMNIFICATION OBLIGATION SHALL INCLUDE, BUT NOT BE LIMITED TO: (i) ALL CLAIMS BY OWNER OR OTHERS AGAINST CONTRACTOR BASED ON ANY DEFECTS OR IMPROPER PERFORMANCE OF SUBCONTRACTOR'S WORK; (ii) ALL CLAIMS, DAMAGE, LOSSES, EXPENSES, ATTORNEY'S FEES AND CAUSES OF ACTION ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH, OR DAMAGE TO OR**

**DESTRUCTION OF TANGIBLE PROPERTY, INCLUDING LOSS OF USE RESULTING THEREFROM, TO THE EXTENT CAUSED BY ANY BREACH OF WARRANTY, FAILURE TO PERFORM THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, OR NEGLIGENT ACT OR OMISSION OF SUBCONTRACTOR OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY SUBCONTRACTOR OR ANYONE FOR WHOSE ACTS SUBCONTRACTOR IS LIABLE. SUBCONTRACTOR'S INDEMNITY OBLIGATIONS SHALL REMAIN IN FULL FORCE AND EFFECT REGARDLESS OF WHETHER THE CLAIM RELATES TO A CLAIM UNDER SUBCONTRACTOR'S WORKERS COMPENSATION POLICY. SUBCONTRACTOR'S OBLIGATION TO INDEMNIFY SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE OR OTHERWISE REDUCE ANY OTHER RIGHT OR OBLIGATION OF CONTRIBUTION OR INDEMNITY WHICH WOULD OTHERWISE EXIST AS TO ANY PARTY OR PERSON IN ANY OTHER PROVISION OF THIS SUBCONTRACT OR UNDER THE LAW. IN THE EVENT OF ANY INDEMNIFIED CLAIM AGAINST CONTRACTOR BY ANY THIRD PERSON, CONTRACTOR RESERVES THE RIGHT TO CHOOSE LEGAL COUNSEL AND DIRECT THE DEFENSE OF SUCH CLAIM AT SUBCONTRACTOR'S SOLE COST AND EXPENSE.**

7.2 Before commencing the Work, and as a condition of payment, the Subcontractor shall purchase and maintain insurance that will protect it from the claims arising out of its operations under this agreement, whether the operations are by the Subcontractor or any of its consultants or subcontractors or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Subcontractor shall purchase and maintain insurance and clauses of the types and descriptions, and in the amounts specified as set forth below, but not less than the types and amounts specified in the General Contract, through insurance companies satisfactory to the Contractor.

**1) Commercial General Liability (CGL)**

- a) CGL with limits of insurance of not less than \$1,000,000 Each Occurrence, \$2,000,000 Products/Completed Operations Aggregate, \$1,000,000 Personal & Advertising Injury, \$100,000 Fire Damage Limit (any one fire), \$5,000 Medical Expense (any one person) and \$2,000,000 General Annual Aggregate. If the CGL coverage contains a General Aggregate Limit, such General Aggregate Limit shall apply separately to each project.
- b) CGL coverage shall be written on ISO Occurrence form CG 00 01 1207 or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, and personal and advertising injury.
- c) **Baldwin & Shell Construction Company and all other parties as required by contract shall be included as Additional Insured on the CGL, using an endorsement providing equivalent coverage to the additional insured.** This insurance for the additional insured shall be as broad as the coverage provided for the named insured Subcontractor. It shall apply as primary and non-contributory insurance before any other insurance or self-insurance, including any deductible, maintained by, or provided to, the additional insured.
- d) Subcontractor shall maintain CGL coverage for itself and all additional insured for the duration of the project and maintain Completed Operations coverage for itself and each additional insured for at least 5 years after completion of the Work, or full duration of the applicable Statute of Repose.

**2) Automobile Liability**

- a) Business Auto Liability with limits of at least \$1,000,000 each accident.
- b) Business Auto coverage must include coverage for liability arising out of all

owned, leased, hired and non-owned automobiles.

- c) **Baldwin & Shell Construction Company and all other parties as required by contract shall be included as Additional Insured on the auto policy.**

### **3) Commercial Umbrella**

- a) Umbrella limits must be at least \$1,000,000.
- b) Umbrella coverage must include all entities that are additional insured on the CGL.
- c) Umbrella coverage for such additional insured shall apply as primary and non-contributory insurance before any other insurance or self-insurance.

### **4) Workers Compensation and Employers Liability**

- a) Employers Liability Insurance limits of at least **\$500,000** each accident for bodily injury by accident and **\$500,000** each employee for injury by disease.
- b) Where applicable, U.S. Longshore and Harbor Workers Compensation Act Endorsement shall be attached to the policy.
- c) Where applicable, the Maritime Coverage Endorsement shall be attached to the policy.

### **5) Waiver of Subrogation**

Subcontractor waives all rights against Contractor, Owner and Architect and their agents, officers, directors and employees for recovery of damages to the extent these damages are covered by commercial general liability, commercial umbrella liability, business auto liability or workers compensation and employers' liability insurance maintained per requirements stated above.

### **6) Certificates of Insurance**

Subcontractor shall provide Contractor with valid certificates of insurance prior to commencement of Work verifying said insurance requirements have been met. Attached to each certificate of insurance shall be a copy of the Additional Insured Endorsement that is part of the Subcontractor's Commercial General Liability Policy.

- 7.3 The Subcontractor shall purchase insurance coverage required under this agreement at the Subcontractor's sole expense. The policies shall contain a provision that coverage will not be cancelled or not renewed until at least thirty (30) days prior written notice has been received by the Contractor. Certificates of Insurance or, if required, copies of the policies, showing required coverage to be in force shall be delivered to the Contractor prior to commencement of the Work. Subcontractor authorizes Contractor to contact Subcontractor's insurance agency or carrier to verify coverage. In the event the Subcontractor fails to obtain or maintain any insurance coverage required under this agreement the Contractor may, but shall not be obligated to, purchase such coverage for the Contractor's benefit and charge the expense to the Subcontractor, or pursue other appropriate remedies against the Subcontractor including but not limited to termination of this agreement.

## ARTICLE 8

### COMPLIANCE WITH LAWS, PERMITS, FEES AND SAFETY

- 8.1 The Subcontractor shall comply with all applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on performance of the Work. Subcontractor authorizes Contractor to contact Subcontractor's insurance agency or carrier to verify coverage. The Subcontractor shall secure and pay for permits, fees, licenses and inspections by government agencies necessary for proper execution and completion of the Work, the furnishing of which is required of the Contractor by the General Contract. **NO WORK SHALL BE PERFORMED UNTIL ALL WRITTEN SAFETY PROGRAMS HAVE BEEN REVIEWED BY**

**CONTRACTOR AND ALL SAFETY DATA SHEETS (SDS) APPLICABLE TO THE WORK HAVE BEEN FILED ON THE PROJECT JOB SITE.**

- 8.2 In accordance with applicable federal and state law, the Subcontractor shall certify that the Subcontractor does not employ or contract with an illegal immigrant by completion of the attached form **Exhibit "IIDC01"**. Subcontractor shall submit subcontractors' certification to Contractor upon execution of this Subcontract. **In addition**, Subcontractor shall obtain certifications from its subcontractors certifying that the subcontractor does not employ or contract with illegal immigrants. Subcontractor shall maintain all certifications of its subcontractors for the entire term of the Subcontract.
- 8.3 Subcontractor shall certify that the Subcontractor does not allow anyone listed on the National Sex Offender Registry to perform any onsite work pursuant to this subcontract by completion of the attached form **Exhibit "SODC01"**. Subcontractor shall submit subcontractors' certification to Contractor upon execution of this Subcontract. **In addition**, Subcontractor shall obtain certifications from its subcontractors certifying that the subcontractor does not allow anyone listed on the National Sex Offender Registry to perform any onsite work pursuant to this subcontract. Subcontractor shall maintain all certifications of its subcontractor for the entire term of the Subcontract. Furthermore, Subcontractor shall perform a routine review to ensure compliance throughout the duration of this subcontract.
- 8.4 If applicable to the Project, for all state agency General Contracts and in accordance with Arkansas Governor's Executive Order 98-04, Subcontractor, shall execute and return to the Contractor the Contract and Grant Disclosure and Certification Form **Exhibit "CGDC01"** upon execution of this Subcontract. Failure to make any disclosure required by Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this Subcontract and subject to all legal remedies available to the Contractor.
- 8.5 The Subcontractor shall take reasonable safety precautions with respect to performance of this Subcontract, shall comply with safety measures initiated by the Contractor and with applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities for the safety of persons and property in accordance with the requirements of the General Contract. The Subcontractor shall report to the Contractor within three (3) days any injury to an employee or agent of the Subcontractor which occurred at the site.

ARTICLE 9  
CHANGES IN THE WORK AND CLAIMS  
FOR ADDITIONAL COMPENSATION OR TIME

- 9.1 Contractor may, at any time, without notice to the Subcontractor's surety and without invalidating this Subcontract, make any changes to the Work, whether such changes increase or diminish the amount of the Work or the Subcontract Sum. Any such changes will be made by written order from Contractor in the form of written Change Order or Field Work Order. Subcontractor shall not make any changes whatsoever except upon written order from Contractor. Subcontractor shall not be entitled to additional compensation for alleged extra work or materials, or changes of any kind except to the extent the same was ordered by Contractor pursuant to written Change Order or written Field Work Order. If Subcontractor performs any alleged additional work which is not upon written order from Contractor, including but not limited to Work directed by Owner or Architect/Engineer, such alleged additional work will be performed at the sole expense of Subcontractor, and Subcontractor expressly and unequivocally waives any right for additional compensation for any such claimed changes in Subcontractor's Work.

- 9.2 If the change in Work provides for an adjustment to the Contract Price, the adjustment shall be based as follows:
- (a) If Contractor is also entitled to an adjustment of its contract sum pursuant to the General Contract for changes in Work thereunder, the actual contract sum adjustment Contractor receives under the General Contract for that portion of the change in Work associated with this Subcontract and based on the terms and conditions outlined in the Contract Documents for calculating the change.
  - (b) In all other cases, changes in the Subcontract sum shall be calculated by either:
    - (1) the unit prices and rates stated in the Contract Documents; or
    - (2) a lump-sum agreed upon; or
    - (3) Time and material cost basis based on pre-approved labor, labor burden, equipment, overhead and profit rates; or
    - (4) As may be otherwise agreed upon
- 9.2.1 If Contractor and Subcontractor cannot agree as to the amount, either of money or time, to be allowed or deducted for any changes in the Work for the Project, it shall nevertheless be the duty of the Subcontractor, upon written notice from the Contractor, to proceed immediately with the change in the Work. The determination of the amount of money or time shall be referred to mediation as provided for in Article 13 below. **IF ANY CHANGES IN WORK CAUSES THIS SUBCONTRACT AMOUNT TO REQUIRE STATE CONTRACTOR LICENSING THE SUBCONTRACTOR SHALL OBTAIN AND SUBMIT TO CONTRACTOR PROOF OF LICENSURE THROUGH THE PARTICULAR STATE LICENSING AUTHORITY (if not already licensed) PRIOR TO FURTHER PAYMENTS.**
- 9.3 Subcontractor shall give written notice to the Contractor of all claims for extras and for extensions of time, promptly and in accordance with the Contract Documents, but in any event within **FIVE (5) DAYS** of the occurrence giving rise to the claim, failing which notice the claim is waived. The notice shall describe in as much detail as possible the change or claim and the cost and time impact of such. Subcontractor shall only be entitled to such additional compensation as shall be paid by Owner to Contractor on Subcontractor's behalf. Subcontractor shall pay all expenses, including Contractor's attorneys' fees, in processing any claim for additional compensation or time extensions on behalf of Subcontractor. Upon request, Subcontractor shall advance payment or provide security for such expenses, and such payment or security shall be a condition precedent to any obligation to process any claim on behalf of Subcontractor.

ARTICLE 10  
DAMAGE TO OTHER WORK

- 10.1 In carrying out its Work, Subcontractor shall take necessary precautions to protect the finished work of Contractor or other trades from damage caused by its operations, and Subcontractor shall repair or replace to Contractor's satisfaction on Contractor's demand all damage caused by its operation, at no expense to the Contractor.

ARTICLE 11  
SITE & SUBSTRATE CONDITIONS

- 11.1 Subcontractor shall continuously keep the premises free from accumulations of waste material or debris caused by its employees or work, and at the direction of the Contractor shall remove all the waste material or debris from and about the Project and shall leave its work clean. In its discretion, and upon **TWENTY-FOUR (24) HOURS** notice, the Contractor may remove the waste material or debris and charge the cost to the Subcontractor. Subcontractor shall locate its materials and equipment to avoid interference with other trades.



- 11.2 Subcontractor has thoroughly studied the existing conditions of the Project site and made allowances for all Project site conditions in the Subcontract Price and furthermore accepts the conditions as satisfactory prior to commencing work. All conditions found unsatisfactory, that could not reasonably be determined at the time the Subcontract Price was determined, shall immediately be brought to the attention of the Contractor. Failure to notify Contractor of unsatisfactory site conditions, including substrates for installation of work performed under this Subcontract, shall obligate the Subcontractor to make all corrections to site or substrate conditions and repair and/or replace unsatisfactory work under this Subcontract due to unsatisfactory site or substrate conditions at no expense to the Contractor.

ARTICLE 12  
CONTRACTOR REMEDIES AND TERMINATION

- 12.1 If the Subcontractor fails to supply enough skilled workers, proper materials or maintain the Project Schedule, or fails to promptly pay its workers, subcontractors or suppliers, or disregards laws, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a material breach of this agreement, the Subcontractor shall be in default. If the Subcontractor fails within **THREE (3) DAYS** after written notification to commence and continue satisfactory correction of the default with diligence, then the Contractor, without prejudice to any other rights or remedies, shall have the right to any of the following remedies:
- 12.1.1 Supply workers, materials, equipment and facilities as the Contractor deems necessary for the completion of the Work or any part which the Subcontractor has failed to complete or perform, and charge the cost, including reasonable overhead, profit, attorneys' fees, costs and expenses to the Subcontractor.
- 12.1.2 Contract with one or more additional contractors to perform such part of the Work as the Contractor determines will provide the most expeditious completion of the Subcontract Work, and charge the cost, including reasonable overhead, profit, attorneys' fees, costs and expenses to the Subcontractor.
- 12.1.3 Withhold any payments due or to become due the Subcontractor pending corrective action in amounts sufficient to cover losses to the extent deemed necessary by the Contractor.

In the event of an emergency affecting the safety of persons or property or time sensitive work that would adversely affect the completion of the project if not performed immediately the Contractor may proceed as above without notice, but the Contractor shall give the Subcontractor notice promptly thereafter.

- 12.2 If the Subcontractor fails to commence and satisfactorily continue correction of a default within **THREE (3) DAYS** after written notification issued under paragraph 12.1, then the Contractor may issue a second written notification, to the Subcontractor and its surety. Such notice shall state that if the Subcontractor fails to commence and continue correction of a default within **SEVEN (7) DAYS** of the written notification, the Subcontract will be terminated by final notice of such. Thereafter, the Contractor may furnish those materials, equipment or employ such workers or subcontractors as the Contractor deems necessary to maintain the orderly progress of the Project. All costs incurred by the Contractor in performing the Work, including reasonable overhead, profit and attorneys' fees, costs and expenses, shall be deducted from any moneys due or to become due the Subcontractor. The Subcontractor shall be liable for the payment of any amount by which such expense may exceed the unpaid balance of the Contract Price. At the Subcontractor's request, the Contractor shall provide a detailed accounting of the costs to finish the Work.
- 12.3 If Work is performed under this Article, the Contractor or other subcontractors shall have the right to take and use any materials, implements, equipment, appliances or tools furnished by or belonging

to the Subcontractor and located at the Project site for the purpose of completing any remaining Work.

ARTICLE 13  
DISPUTE RESOLUTION

- 13.1 If a dispute arises out of or relates to this agreement, the parties shall first endeavor to settle the dispute through direct negotiation.
- 13.2 Unless otherwise agreed in writing, Subcontractor shall continue Work and maintain the Project Schedule pending any dispute and its resolution. If Subcontractor continues so to perform, Contractor shall continue to make payments in accordance with this agreement.
- 13.3 Disputes between Subcontractor and Contractor not resolved by direct negotiation shall be submitted to mediation pursuant to the Construction Industry Mediation Rules of the American Arbitration Association. Mediation is a condition precedent to any form of binding dispute resolution. The parties shall share equally the mediator's and any filing fees. Unless otherwise mutually agreed, the mediation will take place in Little Rock, Arkansas.
- 13.4 If there is an arbitration provision in the General Contract, arbitration shall be in accordance with it. Subcontractor shall join in and become a party to and be bound by such arbitration proceedings. If, because of the objections of other parties, or because of the provisions of the arbitration clause in the General Contract, it is not possible for Subcontractor, or its subcontractors or suppliers, to become parties to the arbitration proceedings, and if Subcontractor's Work becomes an issue in arbitration proceedings then the Subcontractor will, at its own expense, supply counsel, evidence, and witnesses to establish Subcontractor's performance of its obligations to Contractor under this Subcontract. Subcontractor will be bound by any award.

ARTICLE 14  
WARRANTY

- 14.1 The Subcontractor warrants to the Owner, Architect/Engineer and Contractor that materials and equipment furnished under this Subcontract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Subcontractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Subcontractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. This warranty shall be in addition to and not in limitation of any other warranty or remedy required by law or by the Contract Documents.

ARTICLE 15  
NON-ASSIGNMENT

- 15.1 Subcontractor shall not assign nor sublet this Subcontract nor assign any money due or to become due hereunder without first obtaining written consent. Contractor reserves the right to refuse any part of work which Subcontractor proposes to sublet. Sublet entities are obligated to all conditions and requirements of this subcontract including but not limited to all provisions addressing bonds, insurances, licenses, certifications.

ARTICLE 16  
GENERAL CLAUSES

**Space:** Space on the jobsite is limited. Subcontractor is responsible for all storage, handling, hoisting, uncrating, distribution and stocking of material related to its scope of work. Materials must

be stored in an area designated by Contractor. Materials stored improperly will be moved at no additional cost, or Contractor will relocate material at Subcontractor's cost and without liability for damage.

**Deliveries:** All deliveries must be coordinated with Contractor's Project Superintendent. Subcontractor must give at least 48 hours advance written notice of deliveries.

**Supervisor:** Subcontractor will provide a full-time, English-speaking Supervisor. The Supervisor must be present at the jobsite whenever the Subcontractor has workers on site. Contractor must approve the selection and any change of Supervisor.

**Drugs or Alcohol:** The use of any illegal drugs or consumption of any alcoholic beverages at the site will not be tolerated. Any personnel found to be using or under the influence of these substances will be removed from the site by Contractor and not allowed to return. **Repeated violations may result in the termination of this Subcontract.** If requested, Subcontractor shall conduct post-accident substance testing of its personnel on site at the time of the accident.

**Daily Reports:** Subcontractor will provide Contractor complete and accurate daily reports, to be turned in by noon of the following work day.

**Weekly Meetings:** Subcontractor representatives bearing authority to make decisions for the Subcontractor must attend all Contractor weekly progress/safety meetings while there is work in progress or as directed by Contractor. **These meetings are mandatory.**

**Cleanup:** Subcontractor is responsible for general cleanup of its work refuse on a daily basis. If Subcontractor fails to comply, Contractor may perform the cleanup at Subcontractor's cost.

**Safety:** Hardhats, safety glasses, long pants, shirts with sleeves and work boots are required at all times. In addition, Subcontractor is responsible for any additional personal protective equipment relating to its scope of work. Such equipment includes, but is not limited to, fall protection, approved masks, safety appliances and fire extinguishers.

**Unacceptable Prior Work:** Subcontractor will notify Contractor's Project Superintendent in writing of unacceptable substrate, prior to proceeding with work upon it or in that area.

**Schedule:** Subcontractor shall furnish adequate and qualified manpower to meet Contractor's Project Schedule. Subcontractor shall adhere to the schedule. Contractor reserves the right to accelerate the schedule at no additional cost. Subcontractor must coordinate with other trades.

**Damage to Other Work:** Subcontractor shall repair or restore any work damaged by Subcontractor's employees or persons for whom it is responsible.

**Conduct on Jobsite:** At no time will inappropriateness be allowed on the jobsite, including without limitation obscene language, gestures, publications, electronic images, clothing with offensive language or objectionable gestures. Failure to strictly abide by these terms of conduct may result in immediate removal of the individual or company from the jobsite and shall be considered breach of this Agreement.

**Drawings, Specification, Shop Drawings and Product Data:** Subcontractor shall maintain an approved set of all documents on the jobsite at all times when work under this Subcontract is being performed.

**Radios, Headphones and Other Distracting Devices:** All devices not necessary for performing the Work under this Subcontract that interfere with the ability of the Contractor and the Subcontractor to maintain a safe workplace are not allowed in the jobsite work areas.

**Work Times:** Contractor shall determine standard work times for the project. Subcontractor shall not waver from the work times established by Contractor without written consent from Contractor.

#### ARTICLE 17

#### GOVERNING LAW AND INTERPRETATION

- 17.1 This Agreement shall be governed by the laws of Arkansas. The parties acknowledge that each has had the opportunity to consult counsel with regard to its terms, and accordingly the language is not to be construed against or for either party. This Agreement constitutes the entire agreement between the parties and supersedes all previous oral or written understandings. Contractor's failure to exercise any right hereunder or to insist upon performance of any of the terms, covenants

Project # «Project»

«SubcontractNumber»

or conditions hereof shall not be a waiver or relinquishment of the requirement for future performance of such terms, covenants and conditions by Subcontractor.

**BALDWIN & SHELL CONSTRUCTION CO:**

«OurDivision»

**SUBCONTRACTOR:**

«FirmName»

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

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

Name (printed): \_\_\_\_\_

Name (printed): \_\_\_\_\_

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

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

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

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



Sample Certificate for Subcontractors

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement.

PRODUCER: Agent Name, Agent Address; CONTACT NAME: Please provide contact information; PHONE, FAX, E-MAIL ADDRESS; INSURER(S) AFFORDING COVERAGE: ABC Insurance Company; NAIC #: 12345; INSURED: Subcontractor Name and Address

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES.

Table with columns: INSR LTR, TYPE OF INSURANCE, ADDL INSR, SUBR WVD, POLICY NUMBER, POLICY EFF, POLICY EXP, LIMITS. Rows include General Liability, Automobile Liability, Umbrella Liab, and Workers Compensation.

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Baldwin & Shell Construction Company & Project Owner(s) are included as Additional Insured under the Auto Liability and Additional Insured under the General Liability for both "Ongoing Operations" per ISO CG2010 and "Products/Completed Operations" per ISO CG2037...

CERTIFICATE HOLDER CANCELLATION

CERTIFICATE HOLDER: Baldwin & Shell Construction Company; CANCELLATION: SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

### SUBCONTRACTOR PERFORMANCE BOND

BOND NUMBER.....

.....as Principal, and....., a corporation organized and existing under the laws of the State of ....., as Surety, are held and firmly bound unto BALDWIN & SHELL CONSTRUCTION CO., Little Rock, Arkansas, as Obligee, in the amount of..... Dollars(\$.....), for the payment whereof Principal and Surety jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

Whereas, Principal has by written agreement dated .....entered into a subcontract with Obligee for..... (the "Subcontract") which is by this reference made a part hereof.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly and faithfully perform all terms and conditions of the Subcontract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Whenever Principal shall be, and be declared by Obligee to be, in default under the Subcontract, the Obligee having performed Obligee's obligations thereunder:

- (1) After immediate, best efforts investigation, but in any event within fifteen (15) days of such declaration, Surety shall, at its expense:
  - (a) Arrange for Principal, with consent of Obligee, to perform and timely complete the Subcontract; or
  - (b) Undertake to perform and timely complete the Subcontract itself, through its agents or independent contractors; or
  - (c) Obtain bids or negotiated proposals from qualified subcontractors acceptable to Obligee for a subcontract for performance and timely completion of the Subcontract, arrange for a contract to be prepared for execution by Obligee and the subcontractor selected with Obligee's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Subcontract, and pay to Obligee the amount of damages in excess of the balance of the Subcontract price incurred by Obligee resulting from Subcontractor default; or
  - (d) Waive its right to perform and complete, arrange for completion, or obtain a new contractor, determine the amount for which it may be liable to Obligee, and, as soon as practicable after the amount is determined, tender payment therefor to Obligee.
- (2) Notwithstanding the provisions of Paragraph 1, Obligee, after reasonable notice to Surety, may arrange for the performance of Principal's obligation under the Subcontract subject to the provisions of Paragraph 4 herein;
- (3) If Surety elects to perform and complete, arrange for completion, or obtain a new contractor, as provided above, Surety is obligated, subject to the limit of this bond and without duplication, for:
  - (a) The responsibilities of Subcontractor for correction of defective work and completion of the contract;
  - (b) Additional legal, design professional, and delay costs resulting from Subcontractor's default or from the actions of or failure to act of Surety; and
  - (c) Liquidated damages, or if none are specified in the Subcontract, actual damages caused by delayed performance or non-performance of Subcontractor;
- (4) The balance of the Subcontract price, as defined below, shall be credited against the reasonable cost of completing performance of the Subcontract. If completed by the Obligee, and the reasonable cost exceeds the balance of the Subcontract price, the Surety shall pay to the Obligee such excess, but in no event shall the aggregate liability of the Surety exceed the amount of this bond. If the Surety performs under Paragraph 1 above, the balance of the Subcontract price shall be paid to the Surety at the times and in

the manner as such sums would have been payable to Principal had there been no default under the Subcontract. The term "balance of the Subcontract price," shall mean the total amount payable by Obligee to Principal under the Subcontract and any changes to it, less amounts properly paid by Obligee under the Subcontract.

No change, extension, addition or alteration of any provision of the Subcontract and no forbearance on the part of the Obligee will operate to relieve Surety from liability on this Performance Bond, and Surety hereby consents to any such changes, extensions, addition or alteration without further notice to it.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Obligee, its successors or assigns.

Signed and sealed this.....day of ....., 20.....

....., Principal

By: .....

Name: .....

Title: .....

....., Surety

By: .....

Name: .....

Title: .....

**SUBCONTRACTOR PAYMENT BOND**

BOND NUMBER.....

.....as Principal, and  
....., a corporation organized and existing under  
the laws of the State of ..... as Surety, are held and firmly bound unto BALDWIN &  
SHELL CONSTRUCTION CO., Little Rock, Arkansas, as Obligee, for the use and benefit of Claimants as  
below defined, in the amount of .....  
..... Dollars (\$.....), for the payment whereof Principal and Surety  
jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

Whereas, Principal has by written agreement dated .....entered  
into a subcontract with Obligee for .....  
..... (the "Subcontract") which is by this reference made a part hereof.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall  
promptly make payment to all Claimants for (a) all labor, materials or equipment used in the performance  
of the Subcontract, or (b) employment, sales, workers' compensation or unemployment taxes due and  
payable by the Principal in connection with its performance of the Subcontract, then this obligation shall  
be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- (1) In addition to the Obligee or a federal or state tax authority, Claimant means any individual or entity furnishing labor, materials or equipment for use in the performance of the Subcontract. Such "labor, materials or equipment" shall include, without limitation, that part of water, gas power, light, heat, oil, gasoline, telephone service, rental equipment or temporary labor utilized in the performance of the work under the Subcontract, any design professional services required for performance of the work of the Principal or its subcontractors, and all other items for which a materialmen's or laborer's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
- (2) Each Claimant who has not been paid in full before the expiration of ninety (90) days after the date on which (a) the last of such Claimant's work or labor was performed, or materials were furnished by such Claimant, or (b) taxes became due and payable, may sue on this bond for the use of such Claimant. The Obligee shall not be liable for the payment of any costs or expenses of any such suit.
- (3) No suit or action shall be commenced hereunder by any Claimant, (a) after the expiration of one (1) year following the date on which Principal last performed work under the Subcontract or (b) other than in a court of competent jurisdiction in the jurisdiction in which the project is situated. However, if any limitation embodied in this bond is prohibited by any law such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law,
- (4) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

No change, extension, addition or alteration of any provision of the Subcontract and no forbearance on the part of the Obligee will operate to relieve Surety from liability on this Payment Bond, and Surety hereby consents to any such changes, extensions, addition or alteration without further notice to it.

Signed and sealed this.....day of ....., 20.....

....., Principal

By: .....

Name: .....

Title: .....



....., Surety

By: .....

Name: .....

Title: .....

**SUPPLY BOND**

BOND NUMBER.....

KNOW ALL MEN BY THESE PRESENTS: That ..... as Principal, and....., a corporation organized and existing under the laws of the State of ....., as Surety, are held and firmly bound unto BALDWIN & SHELL CONSTRUCTION CO., Little Rock, Arkansas, as Obligee, in the amount of.....Dollars(\$.....), for the payment whereof Principal and Surety jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

Whereas, Principal entered into that certain Purchase Order/Material Contract with the Obligee dated ..... for ....., a copy of which is by referenced made a part hereof ("Purchase Order/Material Contract").

NOW, THEREFORE, if Principal shall faithfully comply with all terms and conditions of said Purchase Order/Material Contract, or if the Principal shall pay, indemnify, and hold harmless the Obligee from all direct damages sustained by the Obligee as a result of any default by the Principal under the Purchase Order/Material Contract, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, further, that any suit by the Obligee under this bond must be instituted before the earlier of; (a) the expiration of one year from the date the Principal was obligated under the Purchase Order/Material Contract to deliver the materials to the Obligee, or (b) the expiration of one year from the date any other default by the Principal under the Purchase Order/Material Contract. If the limitation set forth in the bond is void, prohibited by law or unenforceable for any reason, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable, and said period of limitation shall be deemed to have accrued and shall commence to run no later than the earlier of (y) the date the Principal was obligated under the Purchase Order/Material Contract to deliver the materials to the Obligee or (z) the date of any other default by the Principal under the Purchase Order/Material Contract; and

PROVIDED, further that no right of action shall accrue on this bond to or for the use of any person or corporation other than the Obligee named herein or its successor.

Signed and sealed this.....day of ....., 20.....

....., Principal

By: .....

Name: .....

Title: .....

....., Surety

By: .....

Name: .....

Title: .....

**CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency.

SUBCONTRACTOR: \_\_\_\_\_ SUBCONTRACTOR NAME: \_\_\_\_\_  
 Yes  No

TAXPAYER ID NAME: \_\_\_\_\_ IS THIS FOR:  Goods?  Services?  Both?

YOUR LAST NAME: \_\_\_\_\_ FIRST NAME: \_\_\_\_\_ M.I.: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP CODE: \_\_\_\_\_ COUNTRY: \_\_\_\_\_

**AS A CONDITION OF OBTAINING, EXTENDING, AMENDING, OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED:**

**F O R I N D I V I D U A L S \***

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse *is* a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

Position Held	Mark (√)		Name of Position of Job Held [senator, representative, name of board/ commission, data entry, etc.]	For How Long?		What is the person(s) name and how are they related to you? [i.e., Jane Q. Public, spouse, John Q. Public, Jr., child, etc.]	
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly							
Constitutional Officer							
State Board or Commission Member							
State Employee							

None of the above applies

**F O R A N E N T I T Y ( B U S I N E S S ) \***

Indicate below if any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

Position Held	Mark (√)		Name of Position of Job Held [senator, representative, name of board/commission, data entry, etc.]	For How Long?		What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control?		
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)	Position of Control
General Assembly								
Constitutional Officer								
State Board or Commission Member								
State Employee								

None of the above applies

## Contract and Grant Disclosure and Certification Form

**Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.**

**As an additional condition of obtaining, extending, amending, or renewing a contract with a state agency I agree as follows:**

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.
  
2. I will include the following language as a part of any agreement with a subcontractor:

*Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.*
  
3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

**I certify under penalty of perjury, to the best of my knowledge and belief, all of the above information is true and correct and that I agree to the subcontractor disclosure conditions stated herein.**

Signature \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

Vendor Contact Person \_\_\_\_\_ Title \_\_\_\_\_ Phone No. \_\_\_\_\_

*Agency use only*

Agency \_\_\_\_\_ Agency \_\_\_\_\_ Agency \_\_\_\_\_ Contact \_\_\_\_\_ Contract  
Number \_\_\_\_\_ Name \_\_\_\_\_ Contact Person \_\_\_\_\_ Phone No. \_\_\_\_\_ or Grant No. \_\_\_\_\_



Exhibit "IIDC01"

Subcontract # \_\_\_\_\_  
Subcontract Date: \_\_\_\_\_

JOB #:  
JOB NAME:

### Illegal Immigrant Disclosure Certification

\_\_\_\_\_ certifies that as of the date of this subcontract the subcontractor does not employ or contract with illegal immigrants.

Furthermore, if we subcontract any portion of our work all subcontractors shall certify in a manner that does not violate federal law in existence on January 1, 2007, that the subcontractor, as of the date of their subcontract, does not employ or contract with illegal immigrants. We shall maintain on file the certification of the subcontractor throughout the duration of the term of the contract.

Furthermore, subcontractor agrees and understands that if subcontractor or its subcontractors are found to be in violation of any laws concerning illegal immigrants Baldwin & Shell Construction Co. may terminate the subcontract with the subcontractor and the termination of the subcontract for the violation of this law shall not be considered a breach of the contract by the contractor.

\_\_\_\_\_  
Company Name

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



Exhibit "SODC01"

<b>JOB #:</b> <b>JOB NAME:</b>
-----------------------------------

**Subcontract #** \_\_\_\_\_  
**Subcontract Date:** \_\_\_\_\_

**Sex Offender Disclosure Certification**

\_\_\_\_\_ certifies that as of the date of this subcontract none of our employees who will perform onsite work pursuant to this subcontract are listed on the National Sex Offender Registry.

Furthermore, if we subcontract any portion of our work all subcontractors shall certify that the subcontractor, as of the date of their subcontract, that none of their employees who will perform onsite work pursuant to this subcontract are listed on the National Sex Offender Registry. We shall maintain on file the certification of the subcontractor throughout the duration of the term of the contract.

Furthermore, subcontractor agrees and understands that if subcontractor or its subcontractors are found to be in violation of this certification, Baldwin & Shell Construction Co. may terminate the subcontract with the subcontractor and the termination of the subcontract for the violation of this agreement shall not be considered a breach of the contract by the contractor.

\_\_\_\_\_  
Company Name

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



# AIA<sup>®</sup> Document A201<sup>®</sup> – 2017

## **General Conditions of the Contract for Construction**

**for the following PROJECT:**

*(Name and location or address)*

New Brinkley High School  
100 Tiger Drive  
Brinkley, AR 72021

**THE OWNER:**

*(Name, legal status and address)*

Brinkley Public Schools  
200 Tiger Drive  
Brinkley, AR 72021

**THE ARCHITECT:**

*(Name, legal status and address)*

WDD Architects  
5050 NorthShore Lane  
North Little Rock, AR 72118

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**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

14      **TERMINATION OR SUSPENSION OF THE CONTRACT**

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## **ARTICLE 1 GENERAL PROVISIONS**

### **§ 1.1 Basic Definitions**

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

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

#### **§ 1.1.2 The Contract**

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

#### **§ 1.1.3 The Work**

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

#### **§ 1.1.4 The Project**

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

#### **§ 1.1.5 The Drawings**

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

#### **§ 1.1.6 The Specifications**

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

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

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

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

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

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

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



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

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

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

### § 1.3 Capitalization

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

### § 1.4 Interpretation

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

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

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

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

### § 1.6 Notice

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

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

### § 1.7 Digital Data Use and Transmission

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

### § 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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

## **§ 1.9 ORDER OF PRECEDENCE**

**§ 1.9.1** In case of conflicts between the drawings and specifications, regarding locations and dimensions, the drawings shall govern. In case of conflicts between the drawings and specifications, regarding written requirements for equipment, systems, standards and workmanship for the Work, and performance of related services, the specifications shall govern. In any case of omissions or errors in figures, drawings or specification, the Contractor shall upon discovery submit the matter to the Architect for clarification. The Architect's clarifications are final and binding on all parties, subject to an equitable adjustment in Contract Time or Price pursuant to Articles 7 and 8 or claims and disputes in accordance with Article 15.

**§ 1.9.2** Where figures are given, they shall be preferred to scaled dimensions.

**§ 1.9.3** Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in the Contract Documents, shall be interpreted in accordance with the well-known meanings.

**§ 1.9.4** In case of any inconsistency, conflict or ambiguity among the Contract Documents, the documents shall govern in the following order:

- a. Change Order and written Modifications to this Agreement
- b. this Agreement
- c. drawings (large scale governing over small scale)
- d. approved submittals
- e. information furnished by the Owner
- f. other documents listed in the Agreement (Among categories of documents having the same order of precedence, the term or provision that includes the latest date shall control. Information identified in one Contract Document and not identified in another shall not be considered a conflict or inconsistency.)

## **ARTICLE 2 OWNER**

### **§ 2.1 General**

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

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

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

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

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

Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

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

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

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

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

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

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

§ 2.3.4 The Owner may furnish surveys to Construction Manager describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the sites. The Construction Manager shall independently locate such utility lines and shall be responsible for all breaks and damage to such lines during construction. The Construction Manager shall immediately restore service in the event of any breaks and damage to such lines during construction. Construction Manager shall fully inspect and familiarize itself with the plans, specifications, and site of the Project.

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

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

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

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

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

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for

Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

### **ARTICLE 3 CONTRACTOR**

#### **§ 3.1 General**

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

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

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

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

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

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

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

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

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

**§ 3.3.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor

shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

### **§ 3.4 Labor and Materials**

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

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

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

### **§ 3.5 Warranty**

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

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

### **§ 3.6 Taxes**

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

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

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

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

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

#### § 3.7.4 Concealed or Unknown Conditions

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

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

#### § 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

#### § 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Communications that alter or clarify the Contract Documents shall be confirmed in writing.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### **§ 3.13 Use of Site**

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

### **§ 3.14 Cutting and Patching**

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



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

### **§ 3.15 Cleaning Up**

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

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

### **§ 3.16 Access to Work**

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

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

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

### **§ 3.18 Indemnification**

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

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

## **ARTICLE 4 ARCHITECT**

### **§ 4.1 General**

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

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

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

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

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

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

### **§ 4.2.4 Communications**

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

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

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

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

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

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

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

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

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

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

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

## **ARTICLE 5 SUBCONTRACTORS**

### **§ 5.1 Definitions**

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

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

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

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

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

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

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

### § 5.3 Subcontractual Relations

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

### § 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

## ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

## § 6.2 Mutual Responsibility

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

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

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

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

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

## § 6.3 Owner's Right to Clean Up

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

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 General

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

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

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

### § 7.2 Change Orders

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

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

**§ 7.3 Construction Change Directives**

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

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

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

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

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

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

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

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

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

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

**§ 7.3.9** Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be

reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

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

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

### **ARTICLE 8 TIME**

#### **§ 8.1 Definitions**

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

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

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

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

#### **§ 8.2 Progress and Completion**

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

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

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

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

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

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

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

### **ARTICLE 9 PAYMENTS AND COMPLETION**

#### **§ 9.1 Contract Sum**

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

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

### § 9.2 Schedule of Values

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

### § 9.3 Applications for Payment

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

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

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

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

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

### § 9.4 Certificates for Payment

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

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the



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

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

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

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

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

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

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

### **§ 9.6 Progress Payments**

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

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

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

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

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

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

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

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

#### **§ 9.7 Failure of Payment**

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

#### **§ 9.8 Substantial Completion**

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

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

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

**§ 9.8.4** When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time

within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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

**§ 9.9 Partial Occupancy or Use**

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

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

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

**§ 9.10 Final Completion and Final Payment**

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

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

**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the

Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

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

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

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

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 Safety Precautions and Programs

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

### § 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

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

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

**§ 10.3 Hazardous Materials and Substances**

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

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

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

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

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

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

#### **§ 10.4 Emergencies**

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

### **ARTICLE 11 INSURANCE AND BONDS**

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

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

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

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

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

#### **§ 11.2 Owner's Insurance**

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

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

**§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor,

Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

### **§ 11.3 Waivers of Subrogation**

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

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

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

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

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

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

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

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

### **§ 12.1 Uncovering of Work**

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

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

## § 12.2 Correction of Work

### § 12.2.1 Before Substantial Completion

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

### § 12.2.2 After Substantial Completion

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

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

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

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

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

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

## § 12.3 Acceptance of Nonconforming Work

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



## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **§ 13.1 Governing Law**

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

### **§ 13.2 Successors and Assigns**

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

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

### **§ 13.3 Rights and Remedies**

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

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

### **§ 13.4 Tests and Inspections**

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

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

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

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

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

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

### § 13.5 Interest

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

## ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

### § 14.1 Termination by the Contractor

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

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

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

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

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

### § 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

### § 14.3 Suspension by the Owner for Convenience

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

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

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

### § 14.4 Termination by the Owner for Convenience

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

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

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

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

## ARTICLE 15 CLAIMS AND DISPUTES

### § 15.1 Claims

#### § 15.1.1 Definition

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

#### § 15.1.2 Time Limits on Claims

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

#### § 15.1.3 Notice of Claims

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

occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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

#### § 15.1.4 Continuing Contract Performance

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

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

#### § 15.1.5 Claims for Additional Cost

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

#### § 15.1.6 Claims for Additional Time

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

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

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

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

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

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

#### § 15.2 Initial Decision

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

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data

from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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

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

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

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

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

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

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

### § 15.3 Mediation

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

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to

file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

**§ 15.4 Arbitration**

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

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

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

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

**§ 15.4.4 Consolidation or Joinder**

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

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

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

# **Additions and Deletions Report for AIA® Document A201® – 2017**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 12:21:43 ET on 05/23/2024.

## **PAGE 1**

New Brinkley High School  
100 Tiger Drive  
Brinkley, AR 72021

...

Brinkley Public Schools  
200 Tiger Drive  
Brinkley, AR 72021

...

WDD Architects  
5050 NorthShore Lane  
North Little Rock, AR 72118

## **PAGE 10**

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

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### **§ 1.9 ORDER OF PRECEDENCE**

**§ 1.9.1** In case of conflicts between the drawings and specifications, regarding locations and dimensions, the drawings shall govern. In case of conflicts between the drawings and specifications, regarding written requirements for equipment, systems, standards and workmanship for the Work, and performance of related services, the specifications shall govern. In any case of omissions or errors in figures, drawings or specification, the Contractor shall upon discovery submit the matter to the Architect for clarification. The Architect's clarifications are final and binding on all parties, subject to an equitable adjustment in Contract Time or Price pursuant to Articles 7 and 8 or claims and disputes in accordance with Article 15.

**§ 1.9.2** Where figures are given, they shall be preferred to scaled dimensions.

**§ 1.9.3** Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in the Contract Documents, shall be interpreted in accordance with the well-known meanings.

§ 1.9.4 In case of any inconsistency, conflict or ambiguity among the Contract Documents, the documents shall govern in the following order:

- a. Change Order and written Modifications to this Agreement
- b. this Agreement
- c. drawings (large scale governing over small scale)
- d. approved submittals
- e. information furnished by the Owner
- f. other documents listed in the Agreement (Among categories of documents having the same order of precedence, the term or provision that includes the latest date shall control. Information identified in one Contract Document and not identified in another shall not be considered a conflict or inconsistency.)

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§ 2.3.4 The Owner shall may furnish surveys to Construction Manager describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work sites. The Construction Manager shall independently locate such utility lines and shall be responsible for all breaks and damage to such lines during construction. The Construction Manager shall immediately restore service in the event of any breaks and damage to such lines during construction. Construction Manager shall fully inspect and familiarize itself with the plans, specifications, and site of the Project.

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

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

...

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Communications that alter or clarify the Contract Documents shall be confirmed in writing.

...

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, Contractor in writing, stating whether the Owner or the Architect (1) has reasonable objection to



the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

...

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

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

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

**Certification of Document's Authenticity**  
AIA® Document D401™ – 2003

I, \_\_\_\_\_, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 12:21:43 ET on 05/23/2024 under Order No. 2114499194 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.



(Signed)

PRESIDENT - CAS

(Title)

5/23/24

(Dated)

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF REQUIREMENTS**

- A. Definitions and Explanations: Requirements of work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof will be issued at a later time.
  
- B. Cash allowances stipulated in specifications for this project shall not be made a part of any subcontract agreement by Contractor until materials, work and/or services stipulated have been selected by Owner or Architect. For allowances for materials and installation under a subcontract, Architect will issue supplemental specifications to Contractor to receive a minimum of three (3) subcontract bids for work under the allowance unless instructed otherwise by the Architect.

**1.02 SCHEDULE OF ALLOWANCES**

	<u>Section</u>	<u>Amount</u>
A. Signage - Interior Room & Code Signage	10 14 00	\$12,000
B. Signage - Exterior (Job Site Sign)	10 14 00	\$1,500
C. Signage - Exterior	10 14 00	\$50,000
D. Stage Rigging and Curtain Systems	11 61 33	\$60,000
E. Painted Court Graphics	00 00 00	\$6,000
F. Audio/Visual Systems	00 00 00	\$75,000

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION 01 21 00**

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**PART 1 - GENERAL****1.01 DESCRIPTION OF REQUIREMENTS**

- A. Type of Alternates: The alternates for this project are deductive type. The work described under the alternates shall be included in the Contractor's base bid and indicated as set forth on the Bid Form.
- B. Definition: An alternate is an amount proposed by the Contractor and stated in the proposal to the Owner that will be deducted from the base bid amount if the Owner decides to accept the corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.
- C. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each alternate is complete and fully integrated into the project.
- D. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

**1.02 DESCRIPTION OF DEDUCTIVE ALTERNATES**

- A. DEDUCTIVE ALTERNATE NO. 1 - Veneer option:
  - 1. Use thin brick veneer in lieu of thin stone veneer as described on architectural building elevations.
- B. DEDUCTIVE ALTERNATE NO. 2 - Metal Wall Panel option:
  - 1. Use McElroy Metals "Wave" panel (or approved equal) in lieu of Metal Panel 1 by Pac-Clad as described on architectural building elevations.
- C. DEDUCTIVE ALTERNATE NO. 3 - Wall finish option:
  - 1. Use abuse resistant gypsum board (paint) with corner guards in lieu of PT-1.

**PART 2 - PRODUCTS (Not Applicable)****PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION 01 23 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Pre-blended mortar mixes for use in indicated locations and types of masonry construction as specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 REFERENCE STANDARDS**

- A. ASTM International:
  - 1. ASTM C91 - Standard Specification for Masonry Cement.
  - 2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
  - 3. ASTM C150 - Standard Specification for Portland Cement.
  - 4. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
  - 5. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
  - 6. ASTM C476 - Standard Specification for Grout for Masonry
  - 7. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - 8. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
  - 9. ASTM C1329 - Standard Specification for Mortar Cement.
  - 10. ASTM C1384 - Standard Specification for Admixtures for Masonry Mortars.
  - 11. ASTM E514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
  - 12. ASTM C 1357 - Standard Test Method for Evaluating Masonry Bond Strength.
  - 13. ASTM C 1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
  - 14. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
  - 15. ASTM C 1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar.
  - 16. ASTM C 1019-20 - Standard Test Method for Sampling and Testing Grout for Masonry.

- B. International Masonry Industry All-Weather Council (IMIAC):
  - 1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
  - 2. Recommended Practices and Guide Specification for Hot Weather Masonry Construction.
- C. National Concrete Masonry Association (NCMA):
  - 1. NCMA TEK Bulletin #8-2A Removal of Stains from Concrete Masonry.
  - 2. NCMA TEK Bulletin #8-3A Control and Removal of Efflorescence.

#### **1.04 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: Submit selection and verification samples of mortar.

#### **1.05 CLASSIFICATION OF MORTAR**

- A. Classification by Volume Measurements: Unless otherwise approved by Architect, conform to ASTM C 270 (or latest version), Table 1, for Cement-lime Mortar.
- B. Classification by Test:
  - 1. Strength test, if required, determined with mortar prepared in laboratory selected by Architect or Owner, using representative materials and in proportions proposed for use. Preparation of and curing of mortar and test cubes shall conform to ASTM Specification C 270 of latest issue. Laboratory tests, if required, paid for by Contractor.
  - 2. Minimum Compressive Strength at End of 28 Days: Not less than that prescribed in ASTM C 270 (or latest version), Table 2, for Cement-lime Mortar.

### **PART 2 - PRODUCTS**

#### **2.01 MORTAR MATERIALS**

- A. Mortar Cement & Sand Masonry Mortar: SPEC MIX® Mortar Cement & Sand Masonry Mortar is a dry pre-blended mortar mix containing mortar cement and dried masonry sand formulated for superior bond, workability and board life.
  - 1. Mortar Type: M (2,500 psi).
  - 2. Mortar Type: S (1,800 psi).
  - 3. Applicable Standards: ASTM C 144, ASTM C 270, ASTM C 595, ASTM C 780, ASTM C 1072, ASTM C 1093, ASTM C 1157, ASTM C 1314, ASTM C 1329, ASTM C 1384, ASTM C 1586, ASTM C 1714, ACI 530.1, IMIAC.
- B. Approved Manufacturers:



1. Pro Mix® Masonry Mortar (Types S), as manufactured by Ash Grove Packaging, 315 Phillips Road, North Little Rock, AR 72117, 1-800-548-4219. For colored mortar provide ASH GROVE® Cement Color.
  2. Solomon Colors, Inc. SGS Concentrated Mortar Colors, 800-624-0261. Color to be selected from manufacturer's complete offering.
- C. Basic Requirements: Conform to ASTM C 270 for materials, aggregate, and water and for storage, measurement, and mixing. Weights per cubic foot of materials in mortar are considered as follows:
- D. Portland Cement: Type I or Type II conforming to ASTM C 150.
- E. Sand: Clean sharp granules, free from loam, acids, alkalies, soluble salts, clay, or organic matter, conforming to ASTM C 144.
- F. Quicklime for Lime Putty: Conform to ASTM C 5 with lime slaked and putty prepared in accordance with ASTM C 270. If hydrated lime is used conform to ASTM C 207, Type S.
- G. Mortar for Laying Exterior Masonry: Waterproofed with Dry Block Mortar Admixture by Grace Construction Products.

## **2.02 ANTI-FREEZE ADMIXTURE**

- A. Mortar admixture for use when temperature drops below 50 deg.F.
- B. Provide Conspec Q-Set, or approved equal.

## **2.03 GROUT FOR MASONRY SIGNIFICANCE AND USE (ASTM C1019-20)**

- A. Grout used in masonry is a fluid mixture of cementitious materials and aggregate with a high water content for ease of placement.
- B. During construction, grout is placed within or between absorptive masonry units. Excess water must be removed from grout specimens in order to provide compressive strength test results more nearly indicative of the grout strength in the wall. In this test method, molds are made from masonry units having the same absorption and moisture content characteristics as those being used in the construction.
- C. This test method is used to either help select grout proportions by comparing test values or as a quality control test for uniformity of grout preparation during construction.
- D. The physical exposure condition and curing of the grout are not exactly reproduced, but this test method does subject the grout specimens to absorption conditions similar to those experienced by grout in the wall.
  1. Test results of grout specimens taken from a wall should not be compared to test results obtained with this test method.

## **PART 3 - EXECUTION**

### **3.01 MORTAR MIXING**

- A. Mix complying with manufacturer's instructions. Mix in batches for work immediately on hand. Measure by known capacity volume using barrow, buggy, manufacturer's packages, or related containers or by using approved batching device so specified proportions are consistently maintained. Do not use material that has partially set, been re-tempered, or used, frozen, caked, or become lumpy. Mix mortar with proper water amount for minimum of 3 minutes to desired consistency in batch mixer. Use mortar of as wet a consistency as can conveniently be handled. Do not use mortar which has greatly stiffened and in which cementing material has started to set. Do not re-temper mortar.

### **3.02 MORTAR USES**

- A. **Type N Mortar:** Type N mortar is suitable for general use in exposed masonry above grade. It is recommended for use in parapet walls, chimneys and exterior walls when subject to severe exposure.
- B. **Type S Mortar:** Type S mortar is recommended for use in reinforced and unreinforced masonry where higher flexural strengths than Type N are required.
- C. **Type M Mortar:** Type M mortar is recommended for use in masonry in contact with earth such as foundations, retaining walls, paving, sewers and manholes, and in reinforced masonry.
- D. **Type O Mortar:** Type O mortar is suitable for interior use in non-loadbearing applications.

**END OF SECTION 04 05 13**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Adhered masonry veneer system including the following:
  - 1. Thin Brick veneer.
  - 2. Masonry veneer.
  - 3. Manufactured masonry veneer.
  - 4. Special purpose tile.
  - 5. Installation Products; adhesives, mortars, grouts and sealants.
  - 6. Waterproofing membranes for ceramic tile work.
  - 7. Anti-fracture membranes for ceramic tile work.
  - 8. Thresholds, trim, cementitious backer units and other accessories specified herein.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 REFERENCE STANDARDS**

- A. American Iron and Steel Institute (AISI) Specification for the Design of Cold Formed Steel Structural Members.
- B. American National Standards Institute (ANSI):
  - 1. ANSI A137.1 American National Standard Specifications For Ceramic Tile.
  - 2. ANSI A108.01 - A108.17 American National Standard Specifications For The Installation Of Ceramic Tile.
  - 3. ANSI A118.1 - A118.15 American National Standard Specifications For The Installation Of Ceramic Tile.
- C. ASTM International (ASTM):
  - 1. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
  - 2. ASTM C150 Standard Specification for Portland Cement.
  - 3. ASTM C482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
  - 4. ASTM C503 Standard Specification for Marble Dimension Stone (Exterior).
  - 5. ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
  - 6. ASTM C847 Standard Specification for Metal Lath.
  - 7. ASTM C920 Standard Specification for Elastomeric Joint Sealants.

8. ASTM C955 Standard Specification for Load Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.
  9. ASTM C1670-14 - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.
  10. ASTM C1780-14 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer.
  11. ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing And Waterproofing.
  12. ASTM D227 Standard Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing.
  13. ASTM D1248 Standard Test Method for Staining of Porous Substances by Joint Sealants.
  14. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications.
  15. ASTM D4716 Standard Test Method for Determining the (In Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geo-synthetic Using a Constant Head.
  16. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  17. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
- D. International Organization for Standardization (ISO) 13007 Standards for Grouts and Adhesives.
- E. Masonry Veneer Manufacturer's Association (MVMA) Installation Guide  
[www.ncma.org](http://www.ncma.org)
- F. Materials And Methods Standards Association (MMSA) Bulletins 1-16.
- G. Metal Lath/Steel Framing Association (ML/SFA) 540 Lightweight Steel Framing Systems Manual.
- H. Steel Stud Manufacturers Association (SSMA) Product Technical Information and ICBO Evaluation Service, Inc. Report ER-4943P.
- I. Tile Council Of North America (TCNA) Handbook For Ceramic, Glass, and Stone Tile Installation.

#### **1.04 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

## **1.05 QUALITY ASSURANCE**

- A. Veneer Manufacturer (Single Source Responsibility): Company specializing in ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit with three years minimum experience. Obtain tile from a single source with resources to provide products of consistent quality in appearance and physical properties.
- B. Installation System Manufacturer (Single Source Responsibility): Company specializing in adhesives, mortars, grouts and other installation materials with ten (10) years minimum experience and ISO 9001 certification. Obtain installation materials from single source manufacturer to insure consistent quality and full compatibility.
- C. Submit laboratory confirmation of adhesives, mortars, grouts and other installation materials:
  - 1. Identify proper usage of specified materials using positive analytical method.
  - 2. Identify compatibility of specified materials using positive analytical method.
  - 3. Identify proper color matching of specified materials using a positive analytical method.
- D. Installer qualifications: company specializing in installation of ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit with five years documented experience with installations of similar scope, materials and design.
- E. Mock-Up: Provide mock-up of each type/style/finish/size/color of ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit along with respective installation adhesives, mortars, grouts and other installation materials.
  - 1. Construct areas designated by Architect.
  - 2. Do not proceed with remaining work until material, details and workmanship are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.
  - 4. As approved by Architect, mockup may be incorporated into finished work.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Acceptance at Site: Deliver and store packaged materials in original containers with seals unbroken and labels, including grade seal, intact until time of use, in accordance with manufacturer's instructions.
- B. Store adhered masonry veneer and installation system materials in a dry location; handle in a manner to prevent chipping, breakage, and contamination.
- C. Protect latex additives, waterproofing membranes, epoxy adhesives and sealants from freezing or overheating in accordance with manufacturer's instructions; store at room temperature when possible.
- D. Store Portland cement mortars and grouts in a dry location.

## **1.07 PROJECT/SITE CONDITIONS**

- A. Provide ventilation and protection of environment as recommended by manufacturer.
- B. Prevent carbon dioxide damage to ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit as well as adhesives, mortars, grouts and other installation materials, by venting temporary heaters to the exterior.
- C. Maintain ambient temperatures not less than 50 degrees F or more than 100 degrees F during installation and for a minimum of seven days after completion. Setting of Portland cement is retarded by low temperatures. Protect work for extended period of time and from damage by other trades. Installation with latex Portland cement mortars requires substrate, ambient and material temperatures at least 37 degrees F. There is to be no ice in substrates. Freezing after installation will not damage latex Portland cement mortars. Protect Portland cement based mortars and grouts from direct sunlight, radiant heat, forced ventilation (heat & cold) and drafts until cured to prevent premature evaporation of moisture. Epoxy mortars and grouts require surface temperatures between 60 degrees F and 90 degrees F at time of installation. It is the General Contractor's responsibility to maintain temperature control.

## **1.08 PRE-INSTALLATION CONFERENCE**

- A. Pre-installation conference: At least three weeks prior to commencing the work attend a meeting at the jobsite to discuss conformance with requirements of specification and job site conditions. Representatives of owner, architect, general contractor, adhered masonry veneer subcontractor, adhered masonry veneer manufacturer, Installation System Manufacturer and any other parties who are involved in the scope of this installation shall attend the meeting.

## **1.09 SEQUENCING AND SCHEDULING**

- A. Coordinate installation of adhered masonry veneer work with related work.
- B. Proceed with adhered masonry veneer work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

## **1.10 WARRANTY**

- A. The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 25 years. The manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written twenty five year warranty, which covers materials and labor - reference LATICRETE Warranty Data Sheet 025.0 for complete details and requirements.

- B. For exterior facades over steel or wood framing, the manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written fifteen year warranty, which covers materials and labor - reference LATICRETE Warranty Data Sheet 230.15 for complete details and requirements.

### **1.11 MAINTENANCE**

- A. Submit maintenance data. Include cleaning methods, cleaning solutions recommended, stain removal methods, as well as polishes and waxes recommended.

### **1.12 EXTRA MATERIALS STOCK**

- A. Upon completion of the work of this Section, deliver to the Owner 2 percent minimum additional adhered masonry veneer and trim shape of each type, color, pattern and size used in the Work, as well as extra stock of adhesives, mortars, grouts and other installation materials for the Owner's use in replacement and maintenance. Extra stock shall be from same production run or batch as original adhered masonry veneer and installation materials.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: LATICRETE International, Inc., which is located at: 1 LATICRETE Park N.; Bethany, CT 06524-3423; Toll Free Tel: 800-243-4788.

### **2.02 EXTERIOR ADHERED BRICK VENEER MANUFACTURERS**

- A. Subject to compliance with material characteristics and product performance requirements, provide products by one of the following manufacturers:
  - 1. Interstate Brick: Thin Utility 4 x 12 with corner returns, as supplied by Antique Brick & Block; contact Adam McPike at 501-680-0450 or 501-375-0060.
    - a. Finish: Matte
    - b. Color: Pewter

### **2.03 EXTERIOR ADHERED VENEER MATERIALS**

- A. **Thin Brick:**
  - 1. Grade (Exterior): Type TBX, ASTM C 1088, tested in accordance with ASTM C 67.
  - 2. Size: Utility Size Face, 3-5/8" high x 11-5/8" long x 5/8" thick
  - 3. Finish: Matte
  - 4. Color: Pewter
  - 5. Special shapes or Trim Units: Corners, Edge Cap and Corner Edge Cap
  - 6. Pattern: 1/3 bond

- B. **Thin Stone Veneer:** Manufactured/provided by U.S Stone Industries, LLC, 301 S. 4<sup>th</sup> St, Ste 110, Manhattan, KS 66502, (913) 529-4154, and as supplied by Antique Brick & Block; contact Adam McPike at 501-680-0450 or 501-375-0060. Provide Flats and Corners as indicated on the drawings.
1. **SV-01:** LitePanel Type: Top Ledge Cottonwood; Finish: Honed; Size: 7-5/8" x 23-5/8" x 3/4".
  2. **SV-02:** LitePanel Type: Plaza Gray; Finish: Honed; Size: Refer to drawings.

## 2.04 INSTALLATION ACCESSORIES - EXTERIOR ADHERED VENEER

- A. Waterproofing / Crack Suppression / Air & Water Barrier Membrane to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for waterproofing membrane. Waterproofing Membrane to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured. It shall be certified by IAPMO and ICC approved as a shower pan liner and shall also meet the following physical requirements:
1. Basis of Design: LATICRETE MVIS™ Air & Water Barrier.
  2. Hydrostatic Test (ASTM D4068): Pass.
  3. Elongation @ break (ASTM D751): 20-30%.
  4. System Crack Resistance (ANSI A118.12): Pass (High).
  5. 7 day Tensile Strength (ANSI A118.10): >265 psi.
  6. 7 day Shear Bond Strength (ANSI A118.10); >200 psi.
  7. 28 Day Shear Bond Strength (ANSI A118.4): >214 psi.
  8. Service Rating (TCA/ASTM C627): Extra Heavy.
  9. Total VOC Content: < 0.05 mg/m<sup>3</sup>.
- B. Epoxy Waterproofing Membrane/Flashing Mortar to be 3 component epoxy, trowel applied specifically designed to be used under masonry veneer, stone or thin brick and requires only 24 hours prior to flood testing:
1. Basis of Design: LATAPOXY Waterproof Flashing Mortar.
  2. Breaking Strength (ANSI A118.10): 450-530 psi.
  3. Waterproofness (ANSI A118.10): No Water penetration.
  4. 7 day Shear Bond Strength (ANSI A118.10): 110-150 psi.
  5. 28 Day Shear Bond Strength (ANSI A118.10): 90-120 psi.
  6. 12 Week Shear Bond Strength (ANSI A118.10): 110-130 psi.
  7. Total VOC Content: <3.4 g/L.
- C. Sealer (Exterior Masonry Veneers): water-based formula specifically designed for topical application on porous stones in exterior applications.
1. Basis of Design: LATICRETE STONETECH Heavy Duty Exterior Sealer.
- D. Galvanized, diamond metal lath: flat expanded type, weighing not less than 3.2 lb. per yd<sup>2</sup>. Metal lath shall comply with ASTM C847.
- E. Cleavage membrane: 15 pound asphalt saturated, non-perforated roofing felt complying with ASTM D226, 15 pound coal tar saturated, non-perforated roofing felt complying with ASTM D227 or 4.0 mils thick polyethylene plastic film complying with ASTM D4397.



- F. Cementitious backer board units: size and thickness as specified, complying with ANSI A118.9.

## **2.05 INSTALLATION MATERIALS - EXTERIOR ADHERED VENEER**

- A. Latex Portland Cement Mortar for thick beds, and scratch/plaster coats to be weather, frost, shock resistant and meet the following physical requirements:
  - 1. Basis of Design: LATICRETE MVIS Premium Mortar Bed.
  - 2. Compressive Strength (ANSI A118.7 Modified): >4000 psi.
  - 3. Total VOC Content: < 0.05 mg/m<sup>3</sup>.
- B. Latex Portland Cement Thin Bed Mortar for thin set to be weather, frost, shock resistant, non-flammable and meet the following physical requirements:
  - 1. Basis of Design: LATICRETE MVIS™ Hi-Bond Veneer Mortar.
  - 2. Compressive strength (ASTM C270): >=2900 psi.
  - 3. Shear bond strength (ANSI A118.4 5.2.4): >=300 psi.
  - 4. Sag On Wall (EN 1308): 0.0mm.
  - 5. Total VOC Content: < 0.05 mg/m<sup>3</sup>.
- C. Latex Portland Cement Pointing Mortar to be weather, frost and shock resistant, as well as meet the following physical requirements:
  - 1. Basis of Design: LATICRETE MVIS Premium Pointing Mortar.
  - 2. Compressive Strength (ASTM C91): >=4100 psi.
  - 3. Total VOC Content: < 0.05 mg/m<sup>3</sup>.
- D. Expansion and Control Joint Sealant to be a one component, neutral cure, exterior grade silicone sealant and meet the following requirements:
  - 1. Basis of Design: LATICRETE MVIS Silicone Sealant.
  - 2. Tensile Strength (ASTM C794): 280 psi.
  - 3. Hardness (ASTM D751; Shore A): 25 (colored sealant) /15 (clear sealant).
  - 4. Weather Resistance (QUV Weather-meter): 10000 hours (no change).

## **PART 3 - EXECUTION**

### **3.01 SUBSTRATE EXAMINATION**

- A. Verify that surfaces to be covered with ceramic tile, mosaic, masonry veneer, trim unit, and waterproofing are:
  - 1. Sound, rigid and conform to good design/engineering practices;
  - 2. Systems, including the framing system and panels, over which ceramic tile will be installed shall be in conformance with the International Residential Code (IRC) for residential applications, the International Building Code (IBC) for commercial applications, or applicable building codes.
  - 3. Clean and free of dust, dirt, oil, grease, sealers, curing compounds, laitance, efflorescence, form oil, loose plaster, paint, and scale;
  - 4. For adhered veneer installations when a cementitious bonding material will be used, maximum allowable variation in the substrate - for finishes with edges shorter than 15 inches, maximum allowable variation is 1/4 inch in 10 feet (6 mm in 3 m) from the required plane, with no more than 1/16 inch variation in 12 inches when measured from the high points in the surface. For veneers with at

least one edge 15 inches in length, maximum allowable variation is 1/8 inch in 10 feet from the required plane, with no more than 1/16 inch variation in 24 inches when measured from the high points in the surface. For modular substrate units, such as exterior glue plywood panels or adjacent concrete masonry units, adjacent edges cannot exceed 1/32 inch difference in height. For thick bed (mortar bed) adhered veneers, ceramic tile and stone installations, maximum allowable variation in the installation substrate to be (1/4 inch in 10 feet.

5. Not leveled with gypsum or asphalt based compounds.
  
- B. Concrete surfaces shall be:
  1. Cured a minimum of 28 days at 70 degrees F (21 degrees C), including an initial seven day period of wet curing.
  2. Wood float finished, or better, if the installation is to be done by the thin bed method.
  
- C. Advise Contractor and Architect of any surface or substrate conditions requiring correction before tile work commences. Beginning of work constitutes acceptance of substrate or surface conditions.

### **3.02 SURFACE PREPARATION - EXTERIOR ADHERED VENEERS - FRAMED CONSTRUCTS**

- A. SHEATHING (e.g. EXTERIOR OSB , EXTERIOR GRADE PLYWOOD, & OTHER EXTERIOR RATED SHEATHING) OVER FRAMING
  1. All designs, specifications and construction practices shall be in accordance with industry standards. Refer to latest editions of:
    - a. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members" [www.steel.org](http://www.steel.org);
    - b. Steel Stud Manufacturers Association (SSMA) "Product Technical Information" and "ICBO Evaluation Service, Inc. Report ER-4943P".
    - c. Metal Lath/Steel Framing Association "Steel Framing Systems Manual."
  2. Prior to commencing work, installer shall submit to Architect/Structural Engineer for approval, shop drawings showing wall/facade construction and attachment details. All attachments shall be designed to prevent transfer of building or structural movement to the wall/facade.
  3. Construct all framing with galvanized or other rust resistant steel studs and channels; minimum requirements:
    - a. Stud Gauge: 16 gauge
    - b. Stud Steel: conforming to ASTM A570 with a minimum yield point of 50 ksi
    - c. Stud Spacing: not to exceed 16 inches on center
    - d. Stud Width: 6 inches
    - e. Horizontal Bridging: Not to exceed 4 feet on center; 16 gauge CR channel typical or as specified by structural engineer.
  4. Studs shall be seated squarely in the channel tracks with the stud web and flange abutting the track web, plumbed or aligned, and securely attached to the flanges or web of both the upper and lower tracks by welding. Similarly connect horizontal

- bridging/purlins and anti-racking diagonal bracing as determined by structural engineer. Grind welds smooth and paint with rust inhibiting paint. Finished frame and components shall be properly aligned, square and true.
5. Provide adequate support of framing elements during erection to prevent racking, twisting or bowing. Lay out the exterior rated sheathing installation so all board edges are supported by metal framing (studs vertically and purlins horizontally). Cut/fit the exterior rated sheathing and add additional framing elements as required to support board edges. Stagger boards in courses to prevent continuous vertical joints and allow 1/8 to 3/16 inch between sheets.
  6. Fasten the exterior rated sheathing with 7/8 inch minimum length, non-rusting, self-embedding screws for metal studs (BUILDEX Catalog item 10-24 17/16 Wafer T3Z or equivalent). Fasten the boards every 6 inches at the edges and every 8 inches in the field. Stagger placement of screws at seams. Place screws no less than 3/8 inch, and no more than 1 inch, from board edges.
  7. Follow board manufacturer's installation instructions.
  8. Compliance with design criteria and state and local building codes shall approved and certified by a qualified structural engineer. Use more stringent design criteria when necessary to comply with state and local building code stiffness requirements for thin veneers.

**B. CEMENTITIOUS BACKER UNIT (CBU) OVER STEEL FRAMING**

1. All designs, specifications and construction practices shall be in accordance with industry standards. Refer to latest editions of:
  - a. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members".
  - b. Steel Stud Manufacturers Association (SSMA) "Product Technical Information" and "ICBO Evaluation Service, Inc. Report ER-4943P".
  - c. Metal Lath/Steel Framing Association "Steel Framing Systems Manual."
2. Prior to commencing work, installer shall submit to Architect/Structural Engineer for approval, shop drawings showing wall/facade construction and attachment details. All attachments shall be designed to prevent transfer of building or structural movement to the wall/facade.
3. Construct all framing with galvanized or other rust resistant steel studs and channels; minimum requirements:
  - a. Stud Gauge: 16 gauge
  - b. Stud Steel: conforming to ASTM A570 - latest edition with a minimum yield point of 50 ksi;
  - c. Stud Spacing: not to exceed 16 inches on center;
  - d. Stud Width: 6 inches
  - e. Horizontal Bridging: Not to exceed 4 feet on center; 16 gauge CR channel typical or as specified by structural engineer.
4. Studs shall be seated squarely in the channel tracks with the stud web and flange abutting the track web, plumbed or aligned, and securely attached to the flanges or web of both the upper and lower tracks by welding. Similarly connect horizontal bridging/purlins and anti-racking diagonal bracing as determined by structural engineer. Grind welds smooth and paint with rust inhibiting paint. Finished frame and components shall be properly aligned, square and true.

5. Provide adequate support of framing elements during erection to prevent racking, twisting or bowing. Lay out the CBU installation so all board edges are supported by metal framing (studs vertically and purlins horizontally). Cut/fit CBU and add additional framing elements as required to support board edges. Stagger boards in courses to prevent continuous vertical joints and allow 1/8 to 3/16 inch between sheets.
6. Fasten the CBU with 7/8 inch minimum length, non-rusting, self-embedding screws for metal studs (BUILDEXSYMBOL 226 "Symbol" 10 Catalog item 10-24 17/16 Wafer T3Z or equivalent). Fasten the boards every 6 inches at the edges and every 8 inches in the field. Stagger placement of screws at seams. Place screws no less than 3/8 inch, and no more than 1 inch, from board edges.
7. Tape all the board joints with the alkali resistant 2 inches wide reinforcing mesh provided by the CBU manufacturer imbedded in the same mortar used to install the adhered veneer, ceramic tile, mosaic, pavers, brick or stone.
8. Compliance with design criteria and state and local building codes shall approved and certified by a qualified structural engineer. Use more stringent design criteria when necessary to comply with state and local building code stiffness requirements for thin veneers.

### **3.03 INSTALLATION ACCESSORIES - EXTERIOR ADHERED VENEERS**

- A. Weather Resistant Barrier (WRB) or equivalent - 2 layers or as detailed and specified by Architect.
  1. Install per WRB manufacturer's written installation instructions.
  2. Use the following LATICRETE System Materials: LATICRETE MVIS Air & Water Barrier.
- B. Air and Water Barrier (exterior adhered veneers):
  1. Install the vapor permeable air and water barrier in compliance with current revisions of manufacturer's written installation instructions. Review the installation and plan the application sequence. Pre-cut LATICRETE Waterproofing/Anti-Fracture Fabric (if required), allowing 2 inches for overlap at ends and sides to fit the areas as required. Roll up the pieces for easy handling and placement. Shake or stir LATICRETE MVIS™ Air & Water Barrier before using.
  2. Pre-Treat Cracks and Joints - Install sheathing panels and treat joints in accord with the respective sheathing panel manufacturer's installation instructions, including installation of board joint treatment. Pack any gaps around pipes, lights or other penetrations with LATAPOXY Waterproof Flashing Mortar and allow to harden. Treat substrate joints and seams up to 1/8 inch by applying a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches wide over seam using a paint roller (heavy napped), brush or trowel. While LATICRETE MVIS Air & Water Barrier is still wet embed 6 inches wide LATICRETE Waterproofing/Anti-Fracture Fabric pressing the fabric in firmly so that the LATICRETE MVIS Air & Water Barrier liquid bleeds through the fabric, then immediately apply another liberal coat of LATICRETE MVIS Air & Water Barrier liquid over the fabric using a paint roller, brush or trowel. For substrate joints and seams greater than 1/8 inch; fill seams to a smooth finish with a

LATICRETE Polymer Fortified Veneer Mortar. Allow mortar to set 24 hours, then treat seams by applying a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches wide over seam. While LATICRETE Air & Water Barrier is still wet embed 6 inches wide LATICRETE

Waterproofing/Anti-Fracture Fabric pressing the fabric in firmly so that the LATICRETE MVIS Air & Water Barrier liquid bleeds through the fabric, then immediately apply another liberal coat of LATICRETE MVIS Air & Water Barrier liquid over the fabric. LATICRETE MVIS Air & Water Barrier will dry to a uniform olive green color when it's dry to touch.

3. Pre-Treat Coves and Floor/Wall Intersections - Fill all substrate coves and floor/wall transitions to a smooth finish and changes in plane using a LATICRETE latex-fortified thin-set. Alternatively, a liberal coat of LATICRETE MVIS Air & Water Barrier applied with a paint brush or trowel may be used to fill in cove joints and floor/wall transitions <1/8 inch in width. Apply a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches wide over substrate cracks, cold joints, and control joints using a paint brush or heavy napped paint roller.
4. Movement Joint Loop (Slip Joint) Treatment - Apply a liberal coat of LATICRETE MVIS Air & Water Barrier, approximately 8 inches wide over the areas. Then immediately embed and loop the 6 inches wide LATICRETE Waterproofing/Anti-Fracture Fabric into the substrate movement joint and allow to bleed through. Then top coat with a second liberal coat of LATICRETE MVIS Air & Water Barrier liquid fully encapsulating the LATICRETE Waterproofing/Anti-Fracture Fabric. Repeat process to ensure that all movement joints receive two layers of LATICRETE Waterproofing/Anti-Fracture Fabric.
5. Main Application - Allow any pre-treated areas to dry to the touch. Apply a liberal coat of LATICRETE MVIS Air & Water Barrier using a paint roller (heavy napped) or paint brush over substrate including pre-treated areas and allow to dry to the touch approximately 1- 2 hours at 70 degrees F (21 degrees C) and 50% RH. Apply a second liberal coat of LATICRETE MVIS Air & Water Barrier over the first coat of LATICRETE MVIS Air & Water Barrier. Let topcoat dry to the touch, approximately 1 to 2 hours at 70 degrees F and 50% RH. When last coat has dried to the touch, inspect final surface for pinholes, voids, thin spots or other defects and re-apply as necessary. LATICRETE MVIS Air & Water Barrier will dry to a uniform olive green color when it's dry to touch. Use additional LATICRETE MVIS Air & Water Barrier to seal pinholes, voids, thin spots or other defects and re-apply as necessary. Bring main application of LATICRETE MVIS Air and Water Barrier up to all penetrations through the membrane.
6. Dry coat thickness shall be 20 to 30 mil (0.02 to 0.03 inch); consumption per coat is approximately 0.01 gal/ft<sup>2</sup>; coverage is approximately 100 ft<sup>2</sup> /gal. LATICRETE Waterproofing/Anti-Fracture Fabric shall be used to pre-treat cracks, joints, curves, corners, drains, and penetrations with LATICRETE MVIS™ Air & Water Barrier.

- C. Spray Application of LATICRETE MVIS Air & Water Barrier - Follow all installation and surface preparation requirements outlined in this document and TDS 410M "Spraying LATICRETE MVIS Air & Water Barrier". The sprayer being used for the application of LATICRETE MVIS Air & Water Barrier shall be capable of producing a maximum of 3300 psi (22.8 MPa) with a flow rate of 0.95 to 1.6 GPM using a 0.521 or a 0.631 reversible tip. Keep the unit filled with LATICRETE MVIS Air & Water Barrier to ensure continuous application of liquid. The hose length shall not exceed 100 feet in length and 3/8 inch in diameter.
1. Apply a continuous LATICRETE MVIS Air & Water Barrier film with an overlapping spray. The wet film has a sage green appearance and dries to a darker olive green color. When the first coat has dried to a uniform olive green color, approximately 45 to 90 minutes at 70 degrees F, visually inspect the coating for any voids or pinholes. Fill any defects with additional material and apply the second coat at right angles to the first. The wet film thickness shall be checked periodically using a wet film gauge.
  2. Check application thickness with a wet film gauge periodically as the LATICRETE MVIS Air & Water Barrier is being applied to ensure that the appropriate thickness and coverage is achieved. Bounce back and overspray will consume more product. To achieve the required film thickness, the coating shall be free from pinholes and air bubbles. Bring main application of LATICRETE Air and Water Barrier up to all penetrations through the membrane. Do not back roll the spray applied coating. Allow the LATICRETE MVIS Air & Water Barrier to cure in accord with the instructions in this document and TDS 410M prior to the installation of finish materials. It is important to note that areas not scheduled to receive the LATICRETE MVIS Air & Water Barrier shall be taped off and protected from any potential overspray.
- D. Protection - Provide protection for newly installed membrane, even if covered with a thin-bed stone, masonry veneer, or thin brick installation against exposure to rain or other water for a minimum of 2 hours at 70 degrees F and 50% RH. For temperatures between 45 degrees F and 69 degrees F allow a minimum 24 hour cure period.

### **3.04 INSTALLATION - EXTERIOR ADHERED VENEERS**

- A. Pre-float Method (exterior adhered veneers): Over clean, dimensionally stable and sound concrete and masonry substrates, apply latex-Portland cement thick-bed mortar as scratch/leveling coat in compliance with current revision of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Float surface of scratch/leveling coat plumb, true and allow mortar to set until firm. For installation of thin brick, masonry veneer, and stone, follow appropriate "Exterior Adhered Veneers Method" for "Stacked Veneer" or "Pointed / Grouted" veneer installations.
1. Use the following LATICRETE System Materials: LATICRETE MVIS™ Premium Mortar Bed.

- B. Lath & Plaster Method (exterior adhered veneers): Install cleavage membrane/water resistive barrier complying with current revision of ASTM D226 (No. 15 Type 1), 2 separate layers of cleavage membrane/water resistive barrier complying with ICC-ES AC308 or a combination of both using corrosion resistant fasteners complying with ASTM C1063 Sec. 7.10.2. Install metal lath complying with the local building code requirements and/or 2.5 lb. or 3.4 lb. diamond mesh lath (ASTMC847-10, ASTMC1780). Apply latex-Portland cement mortar as scratch/leveling coat over wire lath, concrete or masonry in compliance with current revision of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions and/or ASTM C1780 Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer. Float surface of scratch/leveling coat plumb, true and allow mortar to set until firm. For installation of thin brick, masonry veneer, or stone, follow the appropriate "Exterior Adhered Veneers" installation method for "Stacked Veneer" or "Pointed / Grouted" veneer installations.
1. Use the following LATICRETE System Materials: LATICRETE MVIS Premium Mortar Bed.
- C. Exterior Adhered Veneers (Tile Council of North America / Marble Institute of America Methodology): Install latex Portland cement mortar in compliance with current revisions of ANSI A108.02 (3.11), A108.1B and ANSI A108.5. Use the appropriate trowel notch size to ensure proper bedding of the tile, brick or stone selected. Work the latex Portland cement mortar into good contact with the substrate and comb with notched side of trowel. Spread only as much latex Portland cement mortar as shall be covered while the mortar surface is still wet and tacky. When installing large format (>8 inches x 8 inches) tile/stone, rib/button/lug back tiles, pavers or sheet mounted ceramics/mosaics, spread latex Portland cement mortar onto the back of (i.e. 'back-butter') each piece/sheet in addition to troweling latex Portland cement mortar over the substrate. Beat each piece/sheet into the latex Portland cement mortar with a beating block or rubber mallet to insure full bedding and flatness. Allow installation to set until firm. Clean excess latex Portland cement mortar from tile or stone face and joints between pieces.
1. Use the following LATICRETE System Materials: LATICRETE MVIS™ Hi-Bond Veneer Mortar.
- D. Exterior Adhered Veneers (Pointed/Grouted - Masonry Veneer Manufacturer's Association Methodology): Moisten the back of each veneer unit and the top of the scratch coat so the surfaces appear damp but are free of standing water. Install masonry veneer adhesive mortar in compliance with current revisions of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Use the appropriate installation tools to ensure proper bedding of veneer unit. Work the masonry veneer adhesive mortar into good contact with the back of the veneer unit making sure the entire unit is buttered to a nominal 1/2 inch (12 mm) thickness. **DO NOT COVER JUST THE PERIMETER!** Buttered masonry veneer units shall be firmly worked onto the scratch coat and slid slightly back and forth or with a slight rotating motion. Allow installation to set until firm. Clean excess latex Portland cement mortar from masonry veneer or stone face and joints between pieces. Installing masonry veneer from the top down will minimize cleanup requirements.

1. Use the following LATICRETE System Materials: LATICRETE MVIS Hi-Bond Veneer Mortar.
- E. Exterior Adhered Veneers (Stacked Veneer - Masonry Veneer Manufacturer's Association Methodology): Moisten the back of each veneer unit and the top of the scratch coat so the surfaces appear damp but are free of standing water. Install masonry veneer adhesive mortar in compliance with current revisions of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Use the appropriate installation tools to ensure proper bedding of veneer unit. Work the masonry veneer adhesive mortar into good contact with the back of the veneer unit making sure the entire unit is buttered to a nominal 1/2 inch thickness. **DO NOT COVER JUST THE PERIMETER!** Buttered masonry veneer units shall be firmly worked onto the scratch coat and slid slightly back and forth or with a slight rotating motion. Allow installation to set until firm. Clean excess latex Portland cement mortar from masonry veneer or stone face and joints between pieces. Tight fitted masonry veneer shall be applied from the corners toward the middle of the wall, and from the bottom toward the top of the wall.
1. Use the following LATICRETE System Materials:
    - a. LATICRETE MVIS Hi-Bond Veneer Mortar
- F. Grouting or Pointing (Exterior Adhered Veneers): Pointing Mortar (for joints up to 1/2 inch: Allow thin brick, masonry, and stone installations to cure a minimum of 24 hours @ 70 degrees F (21 degrees C). Verify grout joints are free of dirt, debris or tile spacers. Sponge or wipe dust/dirt off veneer face and remove any water standing in joints. Surface temperature shall be between 40 to 90 degrees F. Use 2 quarts of clean potable water for 25 lb. of LATICRETE MVIS™ Premium Pointing Mortar. Place water in a clean mixing container and add mortar slowly. Mix with a slow speed mixer to a smooth stiff consistency. Allow mortar to slake for 5 minutes. Re-mix mortar. Pointing mortar/grout may be installed using a grout bag, filling the joints to the desired depth, ensuring the mortar is forced into all voids. The curing time will shall vary significantly with temperature and humidity. Once applied allow to firm to "thumbprint" hardness, trowel, rake and/or dry, soft bristled brush to the desired finish.
1. Use the following LATICRETE System Materials: LATICRETE MVIS Premium Pointing Mortar.
- G. Waterproofing / Flashing: To be designed and detailed by project architect. The function of wall flashing, or through-wall flashing, is to divert moisture which may penetrate the exterior face of the facade, or divert moisture which may condense within the wall from water vapor migration to or from the interior spaces. Flashing are commonly used at changes in configuration of the facade, and between different components of the wall. Typical locations requiring flashing are at the intersection of roof and wall assemblies, under roof parapet and wall coping, over window and door openings, under window sills, at shelf or relieving angles, and at bases of hollow or cavity walls. Flashing shall always turn up against the area or material which is being protected in order to prevent water penetration. Provision shall be made to divert any trapped water back to the outside and away from the face of the building facade. This is commonly done by placing weep holes, tubes or absorbent wicks from 24 to 33 inches at the base of the flashing. Flashing shall



form a drip edge and extend a minimum of 3/8 inch beyond the face of the facade to prevent water from dripping down the face of the facade. Check local building code for proper design, placement and implementation of flashing and weep systems. Coping, which protect the top of a parapet wall from water penetration, shall be flashed, at a minimum, at the joints between the coping material (metal, stone, ceramic tile, pre-cast concrete), but preferably continuous along and beneath the entire length of the coping. Flashing which cannot be adhered or imbedded in the wall construction are either attached to reglets, which are pre-fabricated and pre-cast into the wall assembly, or attached to the wall assembly with mechanical attachments and sealed with sealants. In selecting a flashing, it is very important to verify compatibility of metals used in the window frame and the flashing in order to avoid corrosion from galvanic reactions of dissimilar metals.

- H. Weeps / Pressure Equalization Vents: To be designed and detailed by project architect. Most building codes permit weeps no less than 3/16 inch in diameter and spaced no more than 33 inches on-center. Wick and tube weep spacing recommended at no more than 16 inches on-center. Install weeps and/or vent tubes through movement joints, conforming to the size, type and composition specified and as per weep/vent manufacturer's recommendations, on 2 feet centers minimum, and at all locations indicated in shop drawings, plans and details. Ensure that all weeps and/or equalization tubes are properly placed to reach the waterproofing membrane and/or cavity they are designed to drain/vent, and are clear of dirt, debris, sealant or other obstructions.
- I. Vapor Barrier: Install vapor barrier, conforming to the type and composition specified and as per vapor barrier manufacturer's recommendations, on the side of wall cavity insulation that will be "warm in winter." Complete vapor barrier within two weeks after enclosure of the building. Placement, composition and detail to be provided by project design professional.
- J. Expansion and Control Joints: Provide control or expansion joints as located in contract drawings and in full conformity, especially in width and depth, with architectural details.
  - 1. Substrate joints shall carry through, full width, to surface of tile, brick, masonry veneer or stone.
  - 2. Install expansion joints in tile, brick, masonry veneer or stone work over construction/cold joints or control joints in substrates.
  - 3. Install expansion joints where tile, brick, masonry veneer or stone abut restraining surfaces (such as perimeter walls, curbs and columns), changes in plane and corners.
  - 4. Joint placement depends on application - Follow the Masonry Veneer Manufacturers Association's (MVMA) Installation Guide and Detailing Options for Compliance with ASTM C1780.
  - 5. Joint width:  $\geq 1/8$  inch and  $\leq 1$  inch.
  - 6. Joint width: depth ~2:1 but joint depth shall be  $\geq 1/8$  inch and  $\leq 1/2$  inch.
  - 7. Layout (field defined by joints): 1:1 length: width is optimum but must be  $\leq 2:1$ . Remove all contaminants and foreign material from joint spaces/surfaces, such as dirt, dust, oil, water, frost, setting/grouting materials, sealers and old sealant/backer. Use LATICRETE LATASIL 9118 Primer for underwater and

permanent wet area applications, or for porous stone (e.g. limestone, sandstone etc.) installations. Install appropriate backing material (e.g. closed cell backer rod) based on expansion joint design and as specified in section 07 92 00 - Joint Sealants. Apply masking tape to face of tile, brick or stone veneer. Use caulking gun, or other applicator, to completely fill joints with sealant. Within 5-10 minutes of filling joint, 'tool' sealant surface to a smooth finish. Remove masking tape immediately after tooling joint. Wipe smears or excess sealant off the face of non-glazed tile, brick, stone or other absorptive surfaces immediately.

8. LATICRETE Data Sheets: 233.0, 6526.1
  9. LATICRETE MSDS: LATICRETE MVIS Silicone Sealant, Primer
  10. Use the following LATICRETE System Materials: LATICRETE MVIS Silicone Sealant, LATICRETE LATASIL 9118 Primer
- K. Sealer (Exterior Adhered Veneers): Read entire label before using. Use only as directed. Always test in a small inconspicuous area with a 24-hour cure time to determine ease of application and desired results. Allow new grout installations to cure for 72 hours prior to application. Make sure surface is clean and free of waxes and coatings. Sealer may be applied to damp surfaces one hour after standing water has been removed. Surface temperature is to be between 50 degrees Fahrenheit and 80 degrees Fahrenheit. Ensure that the area is well-ventilated during application and until the surface is dry. Keep children and pets out of the area until treated surface is dry.
1. Ensure cap is closed and sealed, and shake well before use.
  2. Mask off surfaces not intended to be treated.
  3. Liberally apply an even coat using a paint pad, paint brush, paint roller, or low-pressure solvent-resistant sprayer. Do not thin before using.
  4. Allow sealer to penetrate the surface for 10 to 15 minutes; denser materials may require more time for the sealer to penetrate. During this time, distribute excess sealer over the entire area to ensure even penetration.
  5. Thoroughly wipe down the entire surface with a clean, dry cloth to completely remove all excess sealer from the surface. **DO NOT ALLOW SEALER TO COMPLETELY DRY ON THE SURFACE.**
  6. A second coat may be needed for porous, absorbent surfaces. If a second coat is required, it shall be applied one hour after the initial application as directed in steps 2 through 5.
  7. If sealer was not completely wiped off and a residue appears, wipe entire surface with a towel dampened with sealer. Use a white, nylon pad to loosen residue and follow with a clean, white absorbent towel to remove.
  8. Keep newly sealed installations free from contamination for 6 hours at 70 degrees Fahrenheit.
  9. A full cure is achieved in 24 to 72 hours at 70 degrees Fahrenheit. Use of the treated surface may resume in 6- 8 hours. If use of the surface shall resume sooner, cover the treated surface with red rosin paper to protect it until full cure has been achieved.
  10. Rags and equipment that are wet with sealer may be flammable. Clean up promptly after work is completed. Clean equipment with mineral spirits and allow to dry in a well-ventilated area. Allow rags to dry in a well-ventilated area out of reach. When, dry, dispose of in accordance with local waste disposal regulations.

11. Recommended Surfaces: Brick; concrete / masonry; homogeneous granite; veined granite; unpolished, honed and textured limestone; quartzite, bluestone, sandstone, slate, and travertine
  12. Storage and Handling Instructions: Avoid prolonged exposure to vapors. Use in a well-ventilated area. Do not ingest. Avoid contact with eyes and skin. KEEP OUT OF THE REACH OF CHILDREN. Do not freeze or store above 100 degrees Fahrenheit. Do not mix with other chemicals. Do not release to natural waterways.
  13. Use the following LATICRETE Systems Materials: LATICRETE STONETECH® Heavy Duty Exterior Sealer.
- L. Adjusting: Correction of defective work for a period of one year following substantial completion, return to job and correct all defective work. Defective work includes, without limitation, tiles broken in normal abuse due to deficiencies in setting bed, loose tiles or grout, and all other defects which may develop as a result of poor workmanship.

### **3.05 CLEANING**

- A. Clean excess mortar/epoxy from veneer surfaces with water before they harden and as work progresses. Do not contaminate open grout/caulk joints while cleaning. Sponge and wash veneers diagonally across joints. Do not use acids for cleaning. Polish with clean dry cloth. Remove surplus materials and leave premises broom clean.

### **3.06 PROTECTION**

- A. Protect finished installation.
- B. Due to the slow rate of Portland cement hydration and strength development at low temperatures, protect installations exposed to these conditions from traffic for longer than normal periods. Protection applies to the substrate, the installation of adhesives and joint grouts, post-installation (rain and temperature protection) until suitable cure, and also the storage and handling of the cladding material. Extend period of protection of tile work at lower temperatures, below 60 degrees F, and at high relative humidity (>70% R.H.) due to retarded set times of mortar/adhesives. For every 18 degrees F below 70 degrees F installation materials take twice as long to cure. Large format tiles and stones also require longer curing periods in cooler temperature / high humidity environments.
- C. Keep finished work undisturbed until full cure. Suitable protection is to be included in the scope of work.
- D. Each component shall reach a proper cure prior to installing the subsequent installation product.
- E. Tent / shade and heat areas that will be subjected to the elements, or freezing temperatures, during installation and cure periods.

- F. Protect newly installed exterior adhered veneer installations from direct exposure to rain for 7 days at 70 degrees Fahrenheit / 21 degrees Celsius. Protection and corrective action primarily requires temporary enclosures or tarpaulins prior to, during, and immediately after installation to shield from rain. If prolonged exposure occurs, surfaces that appear dry may be saturated internally and require testing to determine suitability of certain overlay substrates, membranes, and adhesives. Protection applies to the substrate, the installation of adhesives and joint grouts, post-installation (rain and temperature protection) until suitable cure, and also the storage and handling of the cladding material.
- G. Replace, or restore, work of other trades damaged or soiled by work under this section.

### **3.07 HEALTH AND SAFETY**

- A. The use of personal protection such as rubber gloves, suitable dust masks, safety glasses and industrial clothing is highly recommended. Discarded packaging, product wash and waste water shall be disposed of as per local, state or federal regulations.

**END OF SECTION 04 05 13.23**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install specified joint reinforcement, anchors, ties, control joints, and related masonry accessories.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 PRODUCT HANDLING**

- A. Protection: Protect masonry accessory materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make replacements necessary to approval of Architect and at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 METAL ACCESSORIES**

- A. CMU Joint Reinforcement: HB Lox-All® Truss Joint Reinforcement 120 Truss-Mesh Standard 9 Gauge Weight Hot-Dip Galvanized in size required.
- B. Non-Load Bearing Partition Anchors: Unless otherwise called for on Structural Drawings, provide mesh wall ties, galvanized 16 gage wire 1/2" square mesh, by 20" long. Width to be 3" for 4" block partitions, and 2" less than the nominal width dimension for 6", 8", 10" and 12" block partitions. Install partition anchors where concrete block abuts other walls or partitions. Mesh anchors to occur in alternate joints to miss joint reinforcing.

- C. CMU Joint Reinforcement: Truss or Ladder type, high tensile strength, standard weight No. 9 steel rods in 10 ft. lengths, in appropriate width. Vertical spacing as shown on drawings.

## **2.02 FINISHES FOR METAL ACCESSORIES**

- A. Finish metal accessories according to the following requirements as set forth in ASCE6/ACI 530.1:
  - 1. Joint Reinforcement, Interior Wall: ASTM A641 Class 1
  - 2. Joint Reinforcement, wire ties or anchors, in exterior walls or interior walls exposed to moist environment: ASTM A153 Class B2
  - 3. Sheet metal ties or anchors completely embedded in mortar or grout: ASTM A525 Class G60
  - 4. Wire ties or anchors in interior walls: ASTM A641 Class 3
  - 5. Sheet metal ties and anchors in exterior walls or interior walls exposed to moist environment: ASTM A153

## **2.03 CONTROL JOINTS IN CONCRETE MASONRY UNITS**

- A. In addition to locations shown on drawings, locate control joints so that spacing does not exceed 1.5 times height of wall or 30'-0" o.c. for reinforced CMU or 25'-0" o.c. for non-reinforced CMU.
- B. Provide preformed gaskets placed in sash grooves of concrete masonry using Dur-O-Wal D/A 2001/2025, or approved equal. Factory extrude from solid section of natural or synthetic rubber conforming to ASTM D-2000 2AA-805, with minimum durometer hardness of not less than 80 when tested in accordance with ASTM D 2240.
- C. At exposed face of CMU, provide backer rod and sealant in addition to extruded sash groove control joint.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION OF MASONRY ACCESSORIES**

- A. Install masonry accessories at proper stages of masonry construction specified in Section 04 20 00 - Unit Masonry, and as required for performance of proper masonry workmanship.
- B. Apply flashing to weather barrier system prior to and/or after installing cladding anchors per weather barrier manufacturer recommendations.

**END OF SECTION 04 05 23**

**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work Included: Furnish labor, tools, scaffolding, and required equipment, and materials for masonry construction specified and required to provide high quality masonry workmanship.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Qualifications of Workmen:
  - 1. For actual cutting and placing of masonry units, use skilled journeyman masons thoroughly experienced with materials and methods specified and thoroughly familiar with design requirements.
  - 2. Have one skilled journeyman mason present at all times during execution of work of this Section who shall personally direct and execute this portion of the Work.

**1.05 SAMPLE FIELD PANELS**

- A. Erect a sample field panel for each of the following masonry materials required for this project:
  - 1. CMU: include special shapes, sills, single corner units, lintel units, solid cap units, and install a typical Control Joint at the center of the panel.
    - a. Sills at interior openings may be 4" x 8" x 16" solid cap units or regular size Lintel units placed upside down to achieve flat and flush surfaces.
- B. Each sample panel is to be 6' long by 4' high. Use full size units to show color, color range, texture, bond, profile of joints, and workmanship. After approval, panel will be the standard for minimum workmanship and appearance requirements. Do not remove panel until authorized by Architect.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. **Materials:** Meet referenced ASTM Standards, with modifications specified herein.
- B. **Lightweight Concrete Blocks (C33-1) and/or Normal Weight Concrete Blocks (C33):**
  - 1. Use nominal 8" x 16" face, thickness required. Conform to ASTM C90 (Latest Edition), Type II. Use Type II, for hollow non-loadbearing concrete masonry units. Cut blocks as required to form jambs, sills, and closers. Use normal weight blocks for below grade block work and at exterior block work that is exposed to weather. Lightweight block may be used at all other locations unless otherwise stated on Architectural or Structural Drawings. At Contractors expense, provide certification of ASTM C90 and C129 compliance from certified testing laboratory.
  - 2. Provide standard "Sash Block" at locations where control and/or expansion joints are called for in CMU construction. Coordinate with control joint material specified in Section 04 05 23.
- C. **Reinforced CMU Construction:** Conform to the provisions of ANSI A41.2 (NBS Handbook 74) and/or ACI/ASCE 530.
- D. **Packaged Materials:** Provide mortar materials specified in Section 04 05 13. Provide masonry accessories specified in Section 04 05 23. Deliver and store packaged materials, including cement, in original packages plainly marked with brand and maker's name. Materials in broken containers and in packages showing water marks and evidence of damage will be wholly rejected. **Mortar color shall be selected by the architect.**
- E. **Concrete Fill:** Fill voids in concrete block where required with structural masonry grout complying with ASTM C476 and ASTM C404. Refer to NCMA TEK 09-04A and TEK 3-2A. Grout may be Fine or Course depending on use. Do not use mortar for this purpose.

### **2.02 MASONRY CLEANERS**

- A. Products approved for use are Sure Klean® 600 Detergent.
  - 1. 101 Lime Solvent for dark-colored brick and tile surfaces.
  - 2. Sure Klean® Vana Trol® acidic cleaner for new masonry surfaces.
  - 3. EaCo Chem NMD 80 buffered acid-based new masonry cleaner.
- B. Provide products by ProSoCo®, Enviro Klean® Safety Klean, alternative to traditional acidic compounds.
- C. Consult masonry manufacturer and ProSoCo Technical Service prior to applying any cleaner. Some cleaners are not suited for use on certain masonry units and may cause damage that will be repaired or replaced at Contractor's expense.



## 2.03 FLEXIBLE FLASHING

- A. Provide **Rhino-Bond** 40 mil peel and stick no-drool flashing by Wire-Bond®, or approved equal. Use termination bar for securing flashing to structure where required at surface-mount substrates incompatible with membrane adhesive.

## PART 3 - EXECUTION

### 3.01 LAYING CONCRETE BLOCK

- A. Lay blocks straight, plumb, and in perfect alignment. Protect concrete blocks from weather by covering during storage and after laying. Before using blocks, dry them to moisture content of approximately the average air-dry condition to which finished walls will be exposed. Take care to keep mortar off face surface of exposed blocks. At end of job, clean exposed block walls. Where necessary to fit around wall switches and openings, cut blocks to neat line with power saw. Refer to drawings for spacing and type of reinforcement and anchors required.
- B. Lay block in 1/2 bond, with mortar finished using a round tool giving concave joints. Nominal thickness of all joints is 3/8" and uniform.

### 3.03 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances specified.
- B. Maximum variation from plumb:
  - 1. In 10 feet: 1/4 inch
  - 2. In 20 feet: 3/8 inch
  - 3. In 40 feet or more: 1/2 inch
- C. Maximum variation from level:
  - 1. In any bay or up to 20 feet: 1/4 inch
  - 2. In 40 feet or more: 1/2 inch
- D. Maximum variation from linear building lines:
  - 1. In any bay or up to 20 feet: 1/2 inch
  - 2. In 40 feet or more: 3/4 inch
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
  - 1. Minus 1/4 inch
  - 2. Plus 1/2 inch
- F. Maximum variation in prepared opening dimensions:
  - 1. Accurate to minus 0 inch
  - 2. Plus 1/4 inch

### **3.04 PROTECTION OF OPEN CAVITY WALLS DURING CONSTRUCTION**

- A. Protection:
1. All exposed openings in CMU construction shall be protected during the erection process to prevent water from entering, especially at the tops of walls, and settling within interior cavities causing leaching and other damaging occurrences resulting from capillary action. Secure temporary waterproof membranes at the end of each day's work to prevent rain and snow from entering the cores and cavities. Planks laid on the wall are not considered adequate cover.
  2. Refer to the Portland Cement Association publication "Recommended Practices for Laying Concrete Block".

### **3.05 INSTALLING FLEXIBLE FLASHING**

- A. Install continuous flexible flashing. Lap material at joints minimum 6" and tightly seal with mastic. Spot bonding of mastic equal to 25% of the flashing area applied at 12 inch intervals is acceptable. Apply mastic by trowel at rate of 50 square feet per gallon unless otherwise shown on the container.
1. Where exposed portions are used as a counter-flashing, lap base flashing at least four inches.
  2. Terminate exterior edge beyond face of wall approximately 1/4-inch.
  3. Turn back edge up 8 inches unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
  4. Terminate interior raised edge in masonry backup unit approximately 2 inches into unit unless shown otherwise.
  5. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.
  6. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
  7. Where ends of flashing terminate turn ends up 2 inch and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
  8. Turn flashing up not less than 8 inches between masonry wythes or behind exterior veneer.

### **3.06 BUILT-IN ITEMS**

- A. Build in wood blocks, strips, wedges, frames, loose lintels, miscellaneous iron and other items furnished by other subcontractors and which may be required for properly securing their work.

### **3.07 FREEZING WEATHER**

- A. Do not lay masonry when outside air temperature is below 40 degrees F., unless suitable means are provided to heat masonry materials and to protect completed work from freezing for at least 48 hours.

### 3.08 CLEANING PREMISES

- A. Mason Contractor: Remove rubbish and building materials left over from operations under his charge, whenever directed by General Constructor. Premises must be left clear and clean. When buildings are completed, completely remove mortar droppings.

### 3.09 BOND BEAMS

- A. Reinforce bond beams as required and fill with 3,000 psi. minimum compressive 28-day strength concrete, unless shown otherwise on structural drawings. Do not use masonry mortar for this purpose.

### 3.10 POINTING AND CLEANING

- A. Cut out defective mortar joints. Refill solidly with mortar and tool to match adjacent work.
- B. On completion clean exposed masonry, removing foreign material, excess mortar and stains. Apply cleaning solution to sample area of approximately 20 square feet at an inconspicuous location approved by Architect. Use cleaning solution specially manufactured for this purpose, applying in accordance with manufacturer's directions. Drench masonry with clean water before applying solution, and after cleaning, rinse with clean water to remove all traces of solution. Protect materials adjacent to masonry from contact with cleaning solution.
- C. High Pressure Water Cleaning: **This method of cleaning will not be allowed on masonry surfaces unless approved by architect and masonry manufacturer.** High pressure water is to be used to saturate the masonry before cleaning takes place and may be used to rinse away cleaning solution and foreign particles after cleaning is complete. Allow mortar to cure for a minimum of seven (7) days before subjecting it to high pressure cleaning. After consulting with Architect and manufacturer for cleaning recommendations, test clean a sample panel of all the materials selected for the work. Apply water at a pressure ranging from 300-500 psi (not to exceed 800 psi). Provide a flow rate of water between 3 and 6 gallons per minute through a "Fan" type, stainless steel tip dispersing a 25° to 50° fan spray. Do not use less than 15° fan spray tip. Application of acidic cleaning compounds through the high pressure system will not be allowed. Do not apply sealer until masonry is completely dry and cleaning has been reviewed by Architect.

### 3.11 SETTING, CLEANING, AND SEALING PAVERS

- A. Set no pavers in freezing temperatures when freezing may occur within 48 hours. Keep lines straight and true and provide finished surfaces brought to true and level planes. Provide completed work free from cracked and broken pavers, and free of chipped edges. Lay out work so that wherever possible, no pavers with less than half size occur. Permit no traffic for 72 hours after setting. Upon completion of installation remove unused materials and rubbish.

- B. Conventional setting bed consists of 1 bag Portland cement, 3 cu. ft. ASTM C 144 graded sand, and approximately 5 gallons "Laticrete 3701" mixed and applied in accordance with printed instructions of Laticrete International, Inc., or approved equal.
- C. Grout for architectural pavers consists of 1 gallon "Laticrete 3701" to 50 pounds dry grout or joint filler mixed and applied in accordance with manufacturer's instructions or approved equal.
- D. Cleaning and Sealing:
  - 1. Clean pavers thoroughly with Hillyard Co. "Renovator"
  - 2. Rinse thoroughly with Hillyard Co. "Nutra-Rinse"
  - 3. Rinse 2-3 times with clean water and allow to dry thoroughly.
  - 4. Seal and finish with 3 coats of Hillyard Co. "Seal 341". USE ONE COAT OF "TERRAZZINE" FOR POROUS SURFACES.

**END OF SECTION 04 20 00**

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**PREPARATION OF HOT-DIP GALVANIZED STEEL SURFACES FOR PAINTING****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Degreasing surfaces
- B. Surface profiling
- C. Washing and rinsing
- D. Steel, including shop-fabricated bollards, in or near direct contact with grade or not protected by substantial roof or canopy overhang.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. Publications
  - 1. American Galvanizers Association (AGA):  
*Inspection of Products Hot-Dip Galvanized After Fabrication*  
*Duplex Systems: Painting Over Hot-Dip Galvanized Steel*
  - 2. Elsevier, van Eijnsbergen, J.F.H., New York, 1994: *Duplex Systems - Hot-Dip Galvanizing Plus Painting Wet Storage Stain*
- B. Reference Standards
  - 1. American Society for Testing and Materials (ASTM):  
*A 123/123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*  
*A 153/153M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*  
*A 780 Repair of Damaged Hot-Dip Galvanized Coatings*

*D 6386 Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting*

*D 7803 Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating*

### **1.05 QUALITY ASSURANCE**

- A. Coating Applicator: Company specializing in painting or Hot-Dip Galvanizing after fabrication.

### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Load and store galvanized articles in accordance with accepted industry standards.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE SURFACE PREPARERS**

- A. Members of the American Galvanizers Association or equal, such as painting contractors, approved by the design professional.

### **2.02 HOT-DIP GALVANIZED MATERIALS**

- A. Material for surface preparation suitable for painting is required to be Hot-Dip galvanized as described in ASTM A123/A 123M and A 153/A 153M. Hot-Dip galvanized articles and fabrications may be newly galvanized, partially galvanized or completely weathered.

### **2.03 HOT-DIP GALVANIZING REQUIREMENTS**

- A. Hot-Dip galvanizing practices shall be in accordance with the applicable portions of ASTM A123/A 123M or A 153/A 153M.
- B. Water quenching or chromate quenching conversion coating should be avoided as these processes interfere with paint adhesion and surface preparation.

## **PART 3 - EXECUTION**

### **3.01 SURFACE SMOOTHING**

*The following process should only be used if high spots of zinc are visible on the parts to be painted.*

- A. Zinc high spots, such as a metal drip line, should be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods.

- B. After cleaning, the surface shall be inspected for conformance to the required zinc thickness in accordance with ASTM A123/A 123M or A 153/A 153M utilizing a magnetic-field-type thickness instrument in accordance with ASTM E 376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with ASTM A 780.

### **3.02 AQUEOUS ALKALINE CLEANING**

*This surface cleaning is required for all galvanized steel parts, except for those that have been galvanized less than 24 hours.*

- A. An alkaline solution, pH in the range of 11 to 12 but not greater than 13, can be used to remove traces of oil, grease or dirt.
- B. This solution can be applied through immersion in a tank filled with the solution, sprayed on, or brushed on with a soft bristle brush, usually nylon and not steel or copper.
- C. When dipping or spraying, the solution works best in the temperature range from 60 to 85 C (140 to 185F).
- D. After cleaning, rinse thoroughly in hot water under pressure. Allow to dry completely before proceeding.

### **3.03 SOLVENT CLEANING**

*This is an alternative to Section 3.02.*

- A. Typical cleaning solvents, such as mineral spirits or high-flash naphtha, can be used to remove oil and grease. The procedure to be used is as specified in SSPC Surface Preparation Specification 1.
- B. Proper rags or brushes should be used to wipe galvanized parts. Small parts may be dipped or cleaned in ultrasonic baths of solvents.
- C. After cleaning, rinse thoroughly in hot water or water under pressure. Allow to dry completely before proceeding.

### **3.04 HAND OR POWER-TOOL CLEANING**

*The following process should be used only if there is visible evidence of wet storage stain on the galvanized surface.*

- A. Hand or power-tool cleaning may be used to clean light deposits of zinc reaction by-products, such as wet storage stain, as specified in SSPC Surface Preparation Specification 2 or 3.

### **3.05 SWEEP BLASTING**

*This process is required for all galvanized parts, except those that have been exposed to the environment for more than one year.*

- A. Abrasive sweep or brush blasting which uses a rapid nozzle movement will roughen the galvanized surface profile. The abrasive material must be chosen with care to provide a stripping action without remove excess zinc layers. Follow the procedures detailed in ASTM D 6386 for abrasive sweep blasting.
- B. Following abrasive blast cleaning, surfaces should be blown down with clean compressed air.

### **3.06 ZINC PHOSPHATE TREATMENT**

*This is an alternate process for Section 3.05.*

- A. This conversion-coating process consists of treating the newly galvanized zinc surface with an acidic zinc phosphate solution containing oxidizing agents and other salts for accelerating the conversion action. Follow the procedures detailed in ASTM D 6386 for zinc phosphate treatment.
- B. After 3 to 6 minutes, the surface should be washed with clean water and allowed to completely dry before application of the paint system.

### **3.07 WASH PRIMER TREATMENT**

*This is an alternate process for Section 3.05.*

- A. This process involves the use of metal conditioner to neutralize surface oxides and hydroxides and to etch the surface. Follow the procedures detailed in ASTM D 6386 for wash primer treatment.
- B. For drying time prior to top coating, follow the manufacturer's instructions. This wash-primer treatment may be better suited to certain types of paint systems.

### **3.08 ACRYLIC PASSIVATION/PRETREATMENT**

*This is an alternate process for Section 3.05.*

- A. The passivation/pretreatment process consists of applying an acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forming a thin film coating. Follow procedures detailed in ASTM D 6386 for acrylic passivation/pretreatment.
- B. Painting is possible any time during a period of four months after application as long as the surface is free of visible zinc oxides or zinc hydroxides.

### **3.09 REPAIR OF DAMAGED COATING**

*The following process should be used only if there is visible damage to the zinc coating.*

- A. The maximum area to be repaired is defined in accordance with ASTM A 123/A 123 M Section 6.2, current edition.
  - 1. The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.



- B. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A 780 whenever damage exceeds 3/16" in width. Minimum thickness requirements for the repair are those described in ASTM A 123/A 123M Section 6.2 current edition.

**END OF SECTION 05 05 16**

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**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Extent of gypsum sheathing is shown on the drawings and described in this section.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Gypsum Association publications:
  - 1. GA-254-2017: Fire-Resistant Gypsum Sheathing
  - 2. GA-600-2018: Fire Resistance and Sound Control Manual
- B. ASTM Standards:
  - 1. C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
  - 2. C11 - Terminology Relating to Gypsum and Related Building Materials and Systems
  - 3. C22 - Specification for Gypsum
  - 4. C473 - Test Methods for Physical Testing of Gypsum Panel Products
  - 5. C645 - Specification for Nonstructural Steel Framing Members
  - 6. C1264 - Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products
  - 7. D3273 - Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
  - 8. E119 - Test Methods for Fire Tests of Building Construction and Materials

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver gypsum sheathing with factory identification of brand and grade. Protect from damage and direct exposure to severe weather. Store on leveled supports off the ground.

## **PART 2-PRODUCTS**

### **2.01 MATERIALS**

- A. Gypsum Sheathing:
  - 1. Manufacturer:
    - a. Dens-Glass® Gold by Georgia Pacific Corporation.
    - b. GlasRoc® by Certainteed.
    - c. Gold Bond® Brand by National Gypsum Company
      - 1) Gold Bond® eXP® Sheathing, Gold Bond® eXP® Fire-Shield® Sheathing
    - d. Green Glass® by Temple-Inland
    - e. Securock® Brand by USG
  - 2. Provide 4'-0" x 8'-0" x 1/2" thick, Fabricate sheathing with fiberglass mat facing on both sides and conforming to ASTM C1177/C1177M and ASTM C1396/C1396M for core requirements. Provide sheathing classed as noncombustible when tested by ASTM E136 with Flame Spread and Smoke Developed rating of 0 when tested by ASTM E84.
- B. Fasteners: Except as otherwise indicated, provide 1", Type S-12, bugle-head cadmium plated steel or stainless steel gypsum board screws for machine installation.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. General: Except as otherwise indicated, comply with manufacturer's instructions and industry standards for the installation of gypsum sheathing.
- B. Horizontal Installation: Install wide panels horizontally with end joints on supports and staggered 2 support spacings where possible, but not less than one support spacing or 12". Fasten at each support with screws (spaced approximately 8" o.c.) set back 3/8" minimum from edges.
- C. Cut boards at penetrations, edges and other obstructions of the work; fit tight against abutting work, except provide 3/8" setback where non-loadbearing work abuts structural elements at head and jambs.
- D. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements.

**END OF SECTION 06 16 43**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install millwork, shelving, ornamental wood items, hardware and accessories specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
1. Shop Drawings: Submit **newly prepared** architectural woodwork Shop Drawings for review by Architect prior to start of fabrication. **Do not duplicate Architect's construction drawings.** Indicate on shop drawings, dimensions, species, matching of panels, profiles of moldings, assembly details, applied finish, surfacing, built-in hardware, and necessary connections to other trades.
    - a. **Contract Document electronic files (including all drawings, specifications, addenda and supplemental information) will not be made available to Bidders or Sub-bidders before the award of a Contract nor will they be made available to the Contractor or Sub-contractors after the award of a Contract. Only conventional, paper reproductions of such information will be made available to parties listed above.**
  2. Brochures: Submit manufacturer's descriptive literature on specialty items not manufactured by the architectural woodworker, as requested by Architect.
  3. Samples: Submit finished samples of each wood species to receive transparent finish.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Standards:
1. "Quality Standards" of the Architectural Woodwork Institute (AWI) are referenced in this specification, however, where more stringent requirements are specified, the more stringent shall govern. Any reference to Premium, Custom or Economy in this specification is as defined in latest edition of the AWI "Quality Standards" and as modified in this specification.

2. Provide Custom grade for any item not given a specific quality grade as defined in latest edition of the AWI "Quality Standards."
- B. Competence: Approved woodwork manufacturer, regularly engaged and well experienced in manufacture of fixtures and wood trim and finish of monumental building type, having reputation for doing satisfactory work on time and successfully completing comparable work. Architect reserves the right to approve woodwork manufacturer selected to furnish woodwork.

### **1.05 FIELD DIMENSIONS**

- A. Woodwork manufacturer is responsible for details and dimensions not controlled by job conditions. Show on Shop Drawings all required field measurements beyond his control. General Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

### **1.06 PRODUCT HANDLING**

- A. Protection: Protect architectural woodwork before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS FOR ARCHITECTURAL WOODWORK**

- A. Stain Finish:
1. Exposed Solid Wood:
    - a. Grade I, Select White Hard Maple Plain Sliced (Flat Cut).
  2. Semi-exposed Solid Wood: Grade II, compatible species to exposed.
  3. Concealed Solid Wood: Mill option hardwood.
  4. Exposed Plywood: "AA" Face Veneer, Book Matched, Plain Sliced Maple Medium Density Fiberboard (MDF) Core.
  5. Semi-exposed Plywood: Mill option hardwood veneer.
  6. Concealed Plywood: Mill option.
- B. Paint Finish:
1. Exposed Solid Wood: Close grained hardwood.
  2. Semi-exposed or Concealed Solid Wood: Mill option.
  3. Exposed Plywood: Hardwood veneer medium density overlay.

### **2.02 STANDING AND RUNNING TRIM**

- A. Fabricate according to AWI Quality Standards for "Custom" Grade with painted finish.

### 2.03 MILLWORK

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for stained painted finish.
- B. Hardware: Install cabinet hardware furnished under this Section of these Specifications.
- C. Edge Banding: Provide solid wood as shown on drawings. **IRONED ON TAPE EDGE BANDING WILL NOT BE ACCEPTED.**
- D. Drawer Construction: Drawers are to be four sided, solid wood, drawer box type. **NO PANEL PRODUCTS WILL BE ALLOWED.** Head screw from the inside of the drawer box and install pulls through the drawer box.
  - 1. Approved Alternate: Blum METABOX steel drawer system [ with BLUMATIC self-closing feature ] , 800-438-6788, as an acceptable product.

### 2.04 HIGH PRESSURE LAMINATED PLASTIC SURFACES

- A. Provide finish surfaces using products from one of the following High Pressure Laminate (HPL) manufacturers, or an equal approved by Architect, in colors and patterns selected by Architect from manufacturer's standard line, in satin finish General Purpose grade:
  - 1. Wilsonart LLC, "Wilsonart" designer colors
  - 2. Nevamar Corporation, "Nevamar" designer colors
  - 3. Formica Corporation, "Formica" designer colors
- B. Fabricate to AWI Quality Standards for "Custom" Grade.
- C. Adhesive: Type I, complying with CS 35.

### 2.05 STAINLESS STEEL COUNTERTOPS

- A. Stainless steel shall be AISI Type 304, chrome nickel alloy containing 18% chromium and 8% nickel, finished with a #4 satin finish. All exposed welds will utilize a continuous bead type weld and shall be ground and re-grained to match the adjacent #4 satin finish.
- B. Minimum gage for counter top and back splash is 16 gage.
- C. Fabricate counter tops with formed edges 1-1/4" thick with a marine edge around the perimeter. Counter tops that do not include an integrally constructed sink will not be formed with a marine edge. Reinforce the underside of the counter with steel channels and cover with sound deadening material. Grind all exposed welds smooth and re-grained to match a #4 satin finish.

## 2.06 HIGH PRESSURE LAMINATED PLASTIC MILLWORK

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for High Pressure Laminate (HPL) and/or Thermally Fused Laminate (TFL) with MDF or particle board (PB) finish on all surfaces.
- B. Provide finish for all surfaces, inside and out, using product from one of the following high pressure plastic laminate manufacturers, or an equal approved by Architect, in colors and patterns selected by Architect from standard range of colors and patterns of approved manufacturer, in satin finish General Purpose grade:
  - 1. Ralph Wilson Plastics, "Wilsonart" designer colors
  - 2. Formica Corporation, "Formica" designer colors
  - 3. Nevamar Corporation, "Nevamar" designer colors
- C. Adhesive: Type I, complying with CS 35.
- D. Install thermally fused **through-color coordinated** PVC edge banding on all drawer and door edges as provided by Charter Industries, 800-538-9088, or approved equal.
  - a. 3mm edging at counter tops, drawers, doors, and splashes.
  - b. 1mm edging at cabinet boxes, exposed shelving, and concealed shelving.

## 2.07 LOW PRESSURE LAMINATED PLASTIC MILLWORK MELAMINE

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for Thermally Fused Melamine (TFM) Laminated finish on **interior** of doors, drawers, sides, and interior shelves **only**.
- B. Install thermally fused **through-color coordinated** PVC edge banding on all drawer and door edges as provided by Charter Industries, 800-538-9088, or approved equal.
  - a. 3mm edging at counter tops, drawers, doors, and splashes.
  - b. 1mm edging at cabinet boxes, exposed shelving, and concealed shelving.

## 2.08 PANELWORK

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, for painted finish.

## 2.09 SHELVING

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, for painted finish.

## 2.10 ORNAMENTAL ITEMS

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, for stained painted finish.



## 2.11 HARDWARE

- A. **Cabinet Doors: (All pulls shall be ADA compliant)**
1. 1 Pair Hinges: Bright Nickel Plated Steel, Medium-Duty, concealed style with a minimum 110 degree opening capability with three-dimensional adjustment and automatic closing as manufactured by SALICE or approved equal. Provide Clip Mounting Plate where required.
  2. 1 Pull: Hafele 101.20.729 Brushed Satin Nickel 3-3/4 Inch Center to Center Bar Cabinet Pull.
  3. 1 Cam Lock, where required, masterkeyed and keyed alike in groups as directed by Architect. Provide Cam Locks for 20% of cabinet doors equal to Medeco Cabinet Locks or as indicated on the drawings.
  4. Provide self-adhesive rubber silencers at each corner of the leading edge of cabinet doors.
- B. **Cabinet Drawers:**
1. 1 Pair Drawer Slides: KV® Tru-Trac TT100 ball-bearing type (Length as required) at face-frame or frame-less construction. Provide heavy duty, full extension drawer slides at file drawers and all drawers over 7" deep.
  2. 1 Pull: Hafele 101.20.729 Brushed Satin Nickel 3-3/4 Inch Center to Center Bar Cabinet Pull.
  3. 1 Cam Lock, where required, masterkeyed and keyed alike in groups as directed by Architect. Provide Cam Locks for 20% of cabinet drawers UON.
- C. **Adjustable Cabinet Shelf Supports:** Millwork subcontractor to install in-line 5mm bore holes with Knappe & Vogt 332 ANO Shelf Support clips where indicated or required.
1. Approved equal: Handy Button Shelf Spoon for 5mm holes, 5/16" Pin Length, Nickel finish, Item Number: THB6144.
- D. **Grommets:** Provide grommets where shown on millwork drawings by Doug Mockett & Co., P.O. Box 3333, Manhattan Beach, California 90266, 213-318-2491, or approved equal. Color to be selected by Architect from manufacturers standard line. Exact locations to be verified with Architect before installation.
1. Provide TG Flip-Top® Series: 2 inch hole plastic grommets in plastic laminated countertops only.
  2. Provide MFG1/A-Metal Flex Grommets: 2-11/16 inch overall, 3-3/8 inch cutout in solid surface or quartz surface countertops.
- E. **Waste | Recycle Space Organizers:** Provide Salice America 19-1/2" High components for bottom mount with adjustable door mount bracket for direct pull-out:
1. 15" Wide x 19-5/8" Deep, Part No. QPAM15228CR for 18" Wide millwork Module for two-32 quart container (double) capacity each.
  2. 18" Wide x 19-5/8" Deep, Part No. QPAM18228CR for 21" Wide millwork Module for two-32 quart container (double) capacity each.
  3. 21" Wide x 19-5/8" Deep, Part No. QPAM21235CR for 24" Wide millwork Module for two-35 quart container (double) capacity each.

- F. **Wall Bracket Standards:** Provide standards s manufactured by Knappe & Vogt® Manufacturing Company, 616-459-3311; [www.kv.com](http://www.kv.com) .
1. 85 Series Double-Slot Wall Standard. 185 Series Double-Flange Adjustable Bracket. For long-run, heavy-duty shelving in light industrial, commercial, and retail applications.
  2. Accessories: 106 ANO (Anochrome) Shelf Rests are recommended for use with 185 Series Double-Flange Adjustable Brackets for anchoring the shelf to the bracket. 107 ANO (Anochrome) Hang Rod Clamp bolts to 185 Series Double-Flange Adjustable Brackets to hold garment rod, if applicable.
  3. Composition and Materials: 85 Series Double-Slot Wall Standards: 16-gauge steel. 185 Series Double-Flange Adjustable Brackets: 16-gauge steel (8", 10", and 12" brackets); 14-gauge steel (14"-24" brackets).
- G. **Wardrobe Rods:** Clothes Hangar Rods - Provide Richelieu Model No. 1211608140 Stainless-Steel Heavy-Duty rod in lengths required with No. 2211612140 end flanges. Provide Model No. 2211603140 center support for rods over 6'-0" long. Outside Diameter: 1-1/16"; Wall Thickness: 0.087".

## 2.12 FABRIC WRAPPED TACK BOARDS

- A. Class A Panels: Homasote DesignWall Panels.
1. Substrate: NCFR(R) fiberboard manufactured from 100 percent recycled wood fiber material; physical properties as follows:
    - a. Thickness: 1/2 inch (13 mm).
    - b. Density: 34-40 pcf (545-640 kg/cubic m).
    - c. Flame Spread: 25, per ASTM E 84.
    - d. Smoke Developed: 20, per ASTM E 84.
    - e. Fuel Contributed: 10.
    - f. Classification: Class A, per NFPA.
  2. Fabric: FR 701(R), as manufactured by Guilford of Maine, physical properties as follows:
    - a. Content: 100 percent polyester.
    - b. Weight: 16.0 +/- 0.5 oz./lin. yard (50 kg +/- 16 g/m).
    - c. ASTM E 84: Class A.
    - d. Color: As selected by Architect from manufacturer's standard range.
  3. Fabrication: Wrap fabric around long edges of panel to back side and laminate to substrate.

## 2.13 COUNTER SUPPORT BRACKETS

- A. Provide Model No. EH-1818 surface-mounted Counter Support Bracket as manufactured by Rakks, 800-826-6006, where indicated on drawings.
- A. Provide Model No. EH-1818FM (Flush Mount), Inside Wall Mount Counter Support Bracket as manufactured by Rakks, 800-826-6006, where indicated on drawings. Mount to side of vertical 2x wood stud blocking. Provide mounting hardware as required.

- B. Floating Shelf Brackets: Provide 12" [ 6" ] [ 9" ], 1.75" tall x 1.5" wide x .25" thick, as manufactured by A & M Hardware, Inc., 888-647-0200 or approved equal.
- C. Hidden Shelf Brackets: Provide 12" [ 6" ] [ 9" ], 1.5" tall x 20" wide x .25" thick, as manufactured by A & M Hardware, Inc., 888-647-0200 or approved equal.
- D. 2.0" Concealed Brackets: Provide [ 9" to 30" ] Support Arm, 2" tall, as manufactured by A & M Hardware, Inc., 888-647-0200 or approved equal.
- E. Hybrid Brackets ( Surface or Concealed ) : Provide [ 9" to 24" ], 1.5" tall, as manufactured by A & M Hardware, Inc., 888-647-0200 or approved equal.
- F. **Installation on CMU or concrete walls:** Use masonry drill bits for Heavy Duty Brackets. Drill into the location of the first screw hole marks. This process will cause some concrete dust to collect around the holes; brush or blow this away before continuing. If using concrete anchors, drive these into the hole first, then place and align each shelving bracket. Finish by drilling the appropriate screws into the anchors and then through the shelving material itself for optimum support. Do not overdrive with power driven drills. Hand tightening is recommended as well as coated (Tapcon) screws.

## 2.14 INSTITUTIONAL GRADE CABINET LOCKS

- A. All cabinet door, drawer, and sliding door locks shall be easily rekeyable such as manufactured by **Olympus Lock, Inc.** All locks will provide a set screw cylinder release system (US Patent 4,899,563) or speed-release cylinder removal system (US Patent 5,121,619) so easy access to the cylinder and cylinder housing can be gained by facility or locksmith personnel for servicing and re-keying. Only a similar patented system that provides working top slides for easy access to top springs and pins is acceptable. No crimping on top slides will be considered. Cylinder spacers will be provided to allow flush fit of lock cylinders on outside of cabinet material. All cam lock cylinders to include a working top slide mechanism and retainer staple to permit easy re-keying and maintenance of lock. All cam locks will have a 1 inch face diameter and include an anti-rotation plate to trap the hex nut and prevent the lock from twisting in the hole. All cam locks to be field reversible such that one straight and one offset cam will provide all locking positions. All locks will provide functionality such that the Keyway will remain in the vertical position regardless of installation as a door or drawer. Finishes will be similar to BHMA standards for US3, US4, US26D and US10B. No painted finishes will be acceptable.
- B. MANUFACTURER: Olympus Lock, Inc., Lynnwood, WA, [www.olympuslock.com](http://www.olympuslock.com)  
Contact: Tel.: (206) 362-3290, Email: [info@olympuslock.com](mailto:info@olympuslock.com).

## **2.15 OTHER MATERIALS**

- A. Provide materials, not specifically described but required for complete and proper installation of architectural woodwork, selected by Contractor subject to approval by Architect.

## **PART 3 - EXECUTION**

### **3.01 FABRICATION**

- A. Fabricate millwork, ornamental wood, and countertops to comply with reviewed Shop Drawings and referenced standards.

### **3.02 FACTORY FINISH**

- A. Factory finish architectural woodwork in accordance with requirements of AWI Section 1500 for Custom finish.
  - 1. Finish System: AWI Section 1500, Conversion Varnish with custom stain color to be selected by architect.
    - a. Close Grain Woods:
      - Washcoat
      - Custom Stain
      - Sealer
      - Sand
      - Top Coat
      - Top Coat
    - b. Open Grain Woods:
      - Custom Stain
      - Sealer
      - Sand
      - Top Coat
      - Top Coat
  - 2. Apply factory finish to all faces and edges that receive stain finish.
- B. For items to receive painted finish, refer to Section 09 91 00.

### **3.03 UNDER-COUNTER AND BUILT-IN ITEMS COORDINATION**

- A. Prior to fabrication, verify exact location of specified and Owner Furnished under-counter and built-in items. Verify dimensions of appliances and equipment to be installed within the millwork. Notify Architect immediately of any dimensional discrepancies that would interfere with installation of under-counter or built-in items.

### **3.04 INSTALLATION**

- A. Install architectural woodwork true, square, plumb, level, and firmly anchored for long life under heavy use.
- B. Install standing and running trim with minimum number of joints. Use full-length pieces, from maximum length of lumber available, to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with Quality Standards for joinery. Butt joints, except as detailed, are not acceptable.
- C. Paneling: Anchor paneling to supporting substrate with concealed panel hanger clips and by blind nailing on backup strips, splined connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
- D. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

### **3.05 FINAL INSPECTION**

- A. General: Prior to final inspection and acceptance by Architect, completely check each installed item and adjust for proper operation.
- B. Compliance:
  - 1. Owner reserves right to request and pay for inspection by representative of the Architectural Woodwork Institute to determine that work of this Section has been performed to comply with referenced standards.
  - 2. In event above inspection determines architectural woodwork, or any part of it does not comply with referenced standards, contractor pays all costs for initial inspection and all subsequently required re-inspections. Immediately remove non-complying items, and immediately replace them with items complying to referenced standards of these specifications, at Contractor's expense.

**END OF SECTION 06 40 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. The extent and location of polymer fabrications is indicated on the drawings.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Product Data:
  - 1. Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
  - 2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.
- D. Shop Drawings:
  - 1. Submit fully dimensioned shop drawings showing countertop [ **and window sill** ] layouts, joinery, terminating conditions, substrate construction, cutouts and holes. Show plumbing installation provisions. Include elevations, section details, and large scale details.
- E. Samples:
  - 1. Submit selection and verification samples for each color, pattern, and finish required.
- F. Quality Assurance Submittals:
  - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
  - 2. Warranty: Specimen copy of specified warranty.
- G. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

#### **1.04 REGULATORY REQUIREMENTS**

- A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.
- B. Adhesives, Sealants, and Sealant Primers:
  - 1. SCAQMD (South Coast Air Quality Management District) Rule 1168.

#### **1.05 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Fabricator Qualifications: Documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.
  - 2. Installer Qualifications: Documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer. [ **Installer shall be the fabricator** ] .
- B. Allowable tolerances:
  - 1. Variation in component size: 1/8".
  - 2. Location of openings: 1/8" from indicated location.

#### **1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Protect units during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

#### **1.07 WARRANTY**

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURER**

- A. Provide products of one of the following manufacturers:
  - 1. Corian® surfaces from the DuPont company
  - 2. Wilsonart® (basis-of-design).
  - 3. Approved equal.

#### **2.02 SOLID POLYMER FABRICATIONS**

- A. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.



- B. Reception Areas: Horizontal surfaces of 1/2" thick solid polymer material adhesively joined with inconspicuous seams; edge details as indicated on Drawings. Vertical surfaces of 1/2" material; eased edge detail to be 1-1/2" profile with 1/8" Round Over unless otherwise indicated on Drawings.
- C. Table tops: 1/2" thick solid polymer material, adhesively joined with inconspicuous seams; edge details as indicated on Drawings.
- D. Countertops with sinks: 1/2" thick countertop of solid polymer material; edge details as indicated on Drawings, complete with **Undermount and Drop-In Single Bowl Sink or Double Bowl** sink. Provide counter complete with backsplash of size shown. Refer to plumbing drawings for sink model selection.
- E. Lavatory tops with undermount bowls: 1/2" thick countertop of solid polymer material; edge details as indicated on Drawings. Provide countertops complete with backsplashes of size shown on Drawings. Use undermount hardware according to manufacturer's instructions.
- F. Window sills: 1/2" thick solid polymer material, adhesively joined with inconspicuous seams; edge details as indicated on Drawings.
- G. Color(s) to be selected by Architect from manufacturer's standard line.
- H. References:
  1. DuPont™ Corian® Solid Surface Product Fabrication - Directional Aesthetics (K-26833).
  2. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Edge Details and Build-ups (K-25293).
  3. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Backsplashes (K-25294).
  4. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Thermoforming (K-25297).

### 2.03 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.
- B. Sealant: Manufacturer's standard mildew-resistant, FDA recognized silicone sealant in color to be selected by Architect from manufacturer's standard line.
- C. Bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount bowls.

## 2.04 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" wide reinforcing strip of solid polymer material under each joint.
- D. Provide holes and cutouts for plumbing and accessories as indicated on the drawings.
- E. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Finish: All surfaces shall have uniform finish.
  - 1. Matte, with a gloss rating of 5 - 20.
- G. Provide permanently attached thermo-formed 1/2" radius cove back splashes specified and install per industry standards. End splashes shall be provided loose for installation at the job site after horizontal surfaces, to which they are to be attached, have been installed. Comply with forming data from manufacturer.
  - 1. Construct matching molds of plywood to form component shape.
  - 2. Form pieces to shape prior to seaming and joining.
  - 3. Cut pieces larger than finished dimensions. Sand edges. Remove all nicks and scratches.
  - 4. Heat entire component uniformly prior to forming.
  - 5. Prevent blistering, whitening and cracking of solid polymer material during forming.
- H. Thermoforming: Comply with forming data from manufacturer.
  - 1. Construct matching molds of plywood to form component shape.
  - 2. Form pieces to shape prior to seaming and joining.
  - 3. Cut pieces larger than finished dimensions. Sand edges. Remove all nicks and scratches.
  - 4. Heat entire component uniformly prior to forming.
  - 5. Prevent blistering, whitening and cracking of solid polymer material during forming.
- I. Cove Back Splashes: Fabricate 1/2" radius cove at intersection of counters and back splashes. Form back splashes using 1/2" solid polymer material.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Installer must examine the substrates and conditions under which polymer fabrications are to be installed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### **3.02 JOB MOCK-UP**

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for architect review.
- B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- C. Approved mock-ups shall remain as part of finished work.

### **3.03 INSTALLATION**

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Adhere bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- D. Adhere bowls to countertops using manufacturer recommended adhesives and color-matched silicone sealant.
- E. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- F. Make plumbing connections to sinks in accordance with Division 15, Mechanical.
- G. Protect surfaces from damage until Date of Substantial Completion. Replace damaged work that cannot be repaired to architect's satisfaction.
- H. Fabricator/Installer is to provide a commercial care and maintenance video, review maintenance procedures and warranty details with the Owner upon completion of project.

**END OF SECTION 06 61 16**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and apply water-repellant sealer materials specified.
  - 1. Clean and seal thin brick surfaces according to published recommendations.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Qualifications of Applicators: Use only workmen thoroughly trained and experienced in skills required, completely familiar with manufacturer's recommended methods of application, and completely familiar with requirements of this Section of specifications.
- B. Manufacturer's Directions: Carefully follow manufacturer's printed directions in application of water repellent. Make available printed directions to Architect's Representative if requested.

**PART 2 - PRODUCTS**

**2.01 EXTERIOR WALL WEATHER SEALER**

- A. All exterior masonry walls of the building, except natural stone, shall receive water based siloxane water repellent.
  - 1. Sure Klean® Weather Seal Siloxane PD (Pre-Dilute) by ProSoCo®.
  - 2. Chemprobe/Tnemec Series 633 Prime-A-Pell® Plus H2O
  - 3. BASF MasterProtect® H 177
- B. Provide Installer's two (2) year guarantee and Manufacturer's five (5) year non-prorated, material warranty for moisture penetration.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Inspection: Carefully inspect installed work of other trades and verify that work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with application in areas of discrepancy until discrepancy are fully resolved.

### **3.02 APPLICATION OF DAMPPROOFING IN GENERAL**

- A. Preparation: Prepare surfaces to receive dampproofing, strictly complying with manufacturer's recommendations.
- B. Application: Apply dampproofing complying with manufacturer's recommendations, covering areas to prevent penetration of moisture.

**END OF SECTION 07 19 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install insulation and related items specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 PRODUCT HANDLING**

- A. Protection:
  - 1. Deliver materials to job site and store in safe dry place with labels intact and legible at time of installation.
  - 2. Protect building insulation materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

**1.05 REFERENCES**

- A. Concealed Installations: Flame Spread rating of not more than 75 and a smoke developed rating of not more than 450 when tested in accordance with ASTM E84.
- B. Exposed Installations: Flame Spread rating of not more than 25 and a smoke developed rating of not more than 450 when tested in accordance with ASTM E84.

**PART 2 - PRODUCTS**

**2.01 RIGID PERIMETER AND WALL INSULATION BOARD**

- A. Where indicated as "Perimeter Insulation" at turn-down slab transitions, provide 2" thick Styrofoam™ Brand Square Edge Extruded Polystyrene (XPS) Foam Insulation Shiplap, Owens Corning® FOAMULAR® 250, or approved equal. Insulation Minimum R-Value is to meet ASHRAE 90.1-2022 for heated Slab-On-Grade Floors of R-15 for 24 inches.
  - 1. Sopra-XPS by Soprema.US, 800-356-3521.
  - 2. Dupont™ Styrofoam™ Brand Cavitymate™ Ultra Extruded Polystyrene Insulation.
  
- B. Where indicated as continuous "Wall Insulation" ABOVE GRADE, provide STYROFOAM™ brand Extruded Polystyrene Foam (XPS) Square Edge Insulation, non-structural sheathing as manufactured by Dow Building Solutions, Owens Corning® FOAMULAR® 250 or approved equal. Material is detailed as 2.5" thick and 48" wide in 8' and 9' lengths with R-5 per inch. Butt joints must be installed over structural members. Continuously seal surface of insulation at all joints with manufacturer's joint closure system for Weather Resistant Barrier (WRB).
  
- C. Installation is to be per manufacturer's recommendations.

### 2.03 BATT INSULATION

- A. Fiberglass Building Insulation Manufacturers:
  - 1. Certainteed, 800-233-8990
  - 2. Johns Manville, 800-866-3234
  - 3. Knauf Insulation, 800-825-4434
  - 4. Owens Corning Fiberglass, 800-GET-PINK
  
- B. Material: Formaldehyde-free Fiberglass type bearing the UL Classification marking as to fire resistance conforming to Federal Specification HH-I-521F, and ASTM C-665:
  - 1. Un-faced, Type I in walls
  
- C. Product: Thermafiber® UltraBatt™; unfaced.
  - 1. Formaldehyde-Free (FF) Option.
  - 2. R-Value: R-10, R-15, R-23, R-24, R30 as applicable.
  - 3. Surface Burning Characteristics: Tested in accordance with ASTM E84, Unfaced: Flame Spread 5 and Smoke Developed 5.

### 2.04 ACOUSTICAL INSULATION

- A. In partitions, provide un-faced Owens-Corning Pink Next Gen™ Fiberglas™ Sound Attenuation Batts (SAB) or approved equal complying with ASTM C 665, Type I and ASTM E 136. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested complying with ASTM E 84. Approved equal manufacturers:
  - 1. Certainteed **NoiseReducer™** Sound Attenuation and Acoustical Ceiling Batts.
  - 2. Knauf Insulation EcoBatt® Insulation with ECOSE® Technology.
  - 3. Johns Manville Unfaced or ComfortTherm® Batts and Rolls.
  - 4. ROCKWOOL Safe'n'Sound® Fire & Soundproof Insulation available in 3" and 6" thicknesses. Mineral wool batt insulation conforms to ASTM C167.



## 2.05 LINER ROOF INSULATION SYSTEM

- A. Acceptable Liner System is Skyliner FP Insulation System from Bay Insulation Systems, 920-406-4000 or approved equal. System to achieve R-value of R-30 (R19+R11), Exposed Purlin Area 0%, and continuous 1" x 3.5" Thermal Spacers.
1. Thermal Spacers: 45 PSI @ 10% deflection with minimum R-6 value as manufactured by Sealed "N" Safe Continuous Insulation System, 888-340-4767, or approved equal. Spacers must comply with design performance of specified Metal Roof Panel System and meet ASHRAE 90.1-2010.
  2. Fabric Description: Woven, HDPE Scrim premium, low-permanence vapor retarder attached underneath the purlin, secured by a 1" x .023 metal banding grid continuous in each direction. Provide adhesive, fasteners and clips required for a complete installation of the system. Fabric and grid color to be white.
  3. Insulation: Meet Standard NAIMA 202-96 (R) certified flexible fiberglass insulation for use in metal buildings.
- B. OSHA Fall Protection (FP): Contractor to meet fall protection requirements for construction workers doing work while on a roof.

## 2.06 METAL BUILDING INSULATION FACING

**THIS CAN BE MANY DIFFERENT FACER TYPES - CHECK WITH DESIGNER**

- A. Manufacturer's of Metal Building Insulation Facing: Subject to compliance with requirements, provide products from the following:
1. "Gymguard"; Lamtec Corporation, 1-800-852-6832, or approved equal.
- B. Facing is to be composed of 0.0015" white metalized polypropylene film laminated to a fiberglass/polyester blend fabric with a fire resistive adhesive. The resulting facing shall have a water vapor transmission rate of 0.02 US perm (ASTM E96, Procedure A), and a mullen burst of 250 psi. Tensile strength shall be 195# in the machine direction and 150# in the cross-machine direction.
- C. Surface Burning Characteristics: Not to exceed 25 flame spread and 50 smoke developed when tested in accordance with UL 723 test or ASTM E84 method.

## 2.07 SAFING INSULATION

- A. Provide semi-rigid product designed for use as a fire stop that is non-combustible and non-corrosive to steel as manufactured by Thermafiber Div. of USG Interiors; Cafco Industries Ltd.; Roxul, or approved equal product combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C665, Type I; minimum density of 4.0 pcf; passing ASTM E136 for combustion characteristics and with Fire Hazard Classification when tested according to ASTM E84; flame spread of 15 or less, fuel contribution of 0 and smoke development of 0.
- B. Curtain Wall Assembly, Spandrel Panels, and Perimeter Joint Protection: Provide Intertek Design No. CEJ 322 P or propose alternate system meeting design conditions, to include the following:

1. Reinforcing angle at horizontal butt joints
2. Perimeter Fire Barrier Reinforcement Angle
3. Curtain Wall Insulation, 2" thick (aluminum foil scrim on interior side of room)
4. Impaling Screws
5. Elastomeric Firestop Spray
6. Other components required for a complete system

## **2.08 FIRE RESISTIVE JOINT SYSTEMS IN RATED ASSEMBLIES**

- A. Thermafiber Safing Insulation - Type SAF

## **2.09 FIRE STOPPING OF THROUGH PENETRATIONS IN RATED ASSEMBLIES**

- A. Thermafiber Safing Insulation - Type SAF

## **2.10 ROOF INSULATION**

- A. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly. Maintain a maximum panel size of 4 feet by 4 feet where polyisocyanurate / fiberboard insulation is specified to be installed in insulation adhesive or hot asphalt. Install only as much insulation as can be made watertight during the same work day.
- B. Polyisocyanurate Board Insulation (organic paper facer): A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, and meeting the criteria established by ASTM C1289, Type II, Class 1, Grade 2. Panels shall have a nominal thickness of 2 inches or as is practicle. Acceptable types are as follows:
  1. Paratherm by Siplast, Inc.
  2. EnergyGuard Polyiso Insulation by GAF Materials Corp.
- C. Tapered Polyisocyanurate Board Insulation (organic paper facer): A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, and meeting the criteria established by ASTM C1289, Type II, Class 1, Grade 2. The tapered system shall incorporate fill panels of a nominal thickness and provide for a roof slope of 1/4-inch. Acceptable types are as follows:
  1. Tapered Paratherm system by Siplast, Inc.
  2. EnergyGuard Tapered Polyiso Insulation by GAF Materials Corp.

## **2.11 ROOF BOARD**

- A. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides, and pre-primed on one side. GP Dens-Deck® Prime Roof Board, distributed by GAF®.
  1. Board Thickness: 1/4-inch.
  2. Thermal Resistance (R value) of: .28.

## **2.12 OTHER MATERIALS**

- A. Provide materials including fasteners and retainers, not specifically described but required for complete and proper installation of building insulation, selected by Contractor subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Inspection: Carefully inspect installed work of other trades and verify that work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.

### **3.02 INSTALLING BATT AND BLANKET INSULATION**

- A. Install vapor barriers flat against framing members, without buckles or wrinkles and secure in place to avoid leakage in air borne water vapor.
- B. After piping and wiring is in place, install and support blanket and batt insulation in position required, and coordinate with framing.
- C. Remove insulation and vapor barriers torn, displaced, water soaked, and damaged. Replace with new material.

### **3.03 INSTALLATION OF FOAMED-IN-PLACE INSULATION**

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

### **3.04 INSTALLING OTHER INSULATION**

- A. Install materials not specifically set forth above in strict accordance with manufacturer's instructions.

**END OF SECTION 07 21 00**

**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Thermal insulation and moisture control system for metal buildings for the following applications:
  - 1. Roofs, with OSHA Compliant, leading-edge fall protection.
    - a. Provide GymGuard Polypropylene / Fiberglass-Polyester Blend Fabric by Lamtec® Corporation or approved equal at entire gymnasium portion.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Product Data: Provide manufacturer's data for each of the following, including:
  - 1. Roof installation instructions.
  - 2. Product data sheet.
  - 3. Recycle content certification for fiberglass insulation products - minimum 50% recycled content for all fiberglass insulation materials.
- D. Shop Drawings: Provide shop drawings that indicate the following:
  - 1. Liner fabric layout.
  - 2. Insulation layout and cut list.
  - 3. Customer and project information.

**1.04 REFERENCES**

- A. American Society for Testing of Materials (ASTM):
  - 1. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
  - 2. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
  - 3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).

5. ASTM E 2178 - Standard Test Method for Air Permeance of Metal Buildings.
- B. North American Insulation Manufacturers Association (NAIMA):
  1. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings.
- C. National Fire Protection Association (NFPA):
  1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories (UL):
  1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

### **1.05 DESIGN REQUIREMENTS**

- A. Insulation R-Value of R-30 or U Factor of U 0.033 for installed roof system.
- B. The installed roof system shall provide a continuous vapor barrier.

### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.
- B. Bay Insulation shall approve all materials used in the SkyLiner® Insulation System. Contact Bay Insulation for specific materials approved for use with the SkyLiner® Insulation System.
  1. Substitution of any original components will nullify compliance with OSHA standards for fall protection.

### **1.07 SAFETY PRECAUTIONS**

- A. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.
- B. Workers must use OSHA required fall protection when installing the banding and fabric system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).
- C. The SkyLiner® Insulation System meets:
  1. OSHA 29 CFR 1926.502(c)(4)(i) - Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop test shall consist of a 400-pound (180 kg) bag of sand 30" ± 2" (76 cm ± 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not less than 42" (1.1 m) above that level.

2. OSHA 29 CFR 1926.502(i)(2) - All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment and materials that may be imposed on the cover at any one time.
  3. OSHA 29 CFR 1926.754(e)(3) - covering roof and floor openings.
  4. OSHA 29 CFR 1926.754(e)(3)(i) - Covers for roof and floor openings shall be capable of supporting, without failure, twice the weight of the employees, equipment and materials that may be imposed on the cover at any one time.
- D. Banding has sharp edges. Cut proof gloves should be worn when handling.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Store products indoors or in a dry, covered area.
- B. Do not open products until ready to use.
- C. Protect products from potential construction site damage.
- D. Use care when opening products as pallets may shift during shipment.
- E. Banding has sharp edges. Wear cut proof gloves when handling.
- F. Wear safety glasses when unpacking materials.

## **1.09 PROJECT CONDITIONS**

- A. For best results, do not install this system outside of the temperature, humidity, ventilation, and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100°F prior to installation.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Bay Insulation Systems, Inc., Green Bay, WI, 54311; [www.bayinsulation.com](http://www.bayinsulation.com)

### **2.02 MATERIALS**

- A. The SkyLiner® System consists of the following materials:
  1. Unfaced light density fiberglass metal building insulation in one of the following product categories:
    - a. Metal Building Insulation.
      - 1) Complies with ASTM C991 Type 1.
      - 2) Complies with NAIMA 202-96-REV 2000.
      - 3) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E84, NFPA 255 and UL 723.

- 4) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
- 5) Thermal Resistance: Available R-Values = R10, R11, R13, R16, R19, R25 or R30.
- 6) Unfaced.
- 7) GREENGUARD Indoor Air Quality Certified®.
- 8) GREENGUARD Gold Certified.
- b. Metal Building Filler Blanket Insulation.
  - 1) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84, NFPA 255 and UL 723.
  - 2) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
  - 3) Thermal Resistance: Available R-Values = R10, R11, R13, R16, R19, R25 or R30.
  - 4) Unfaced.
  - 5) GREENGUARD Indoor Air Quality Certified®.
  - 6) GREENGUARD Gold Certified.
2. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
  - a. ASTM C1136, Types I through VI.
    - 1) Type 1-IV exception for dimensional stability (value is <2.0%).
  - b. Perm rating: 0.02 or 0.03 when tested in accordance with ASTM E 96 Procedure A.
  - c. Flame Spread Index < 25 and Smoke Developed Index < 50 when tested in accordance with ASTM E 84.
  - d. Color:
    - 1) Bright White, Sky Blue Backing.
    - 2) Black.
    - 3) Silver Grey.
3. Vapor barrier adhesive. Complies with the following:
  - a. BayGrip™ Contact Adhesive; CA Compliant.
  - b. BayGrip™ Fast Dry Pressure Sensitive Adhesive; CA Compliant.
4. Double sided vapor barrier tape. Complies with the following:
  - a. SkyLiner Double-Faced Tape.
  - b. 2" width.
5. Patch tape. Complies with the following:
  - a. SkyLiner Repair Tape.
6. Metal Banding/Straps. Complies with the following:
  - a. SkyLiner® Banding, 1" x 0.023 continuous length metal banding.
  - b. Exposed color to match vapor barrier.
    - 1) White.
7. Thermal breaks.
  - a. Closed cell polyethylene foam tape for wall applications. Complies with the following:
    - 1) 0.125" thick to 0.375" thick.
    - 2) 3.0" wide.



- b. Thermal spacer blocks. Complies with the following:
  - 1) Extruded or expanded polystyrene.
  - 2) Minimum width 3.0".
  - 3) Thickness 0.5" to 1.0".
- 8. Fasteners & Clips.
  - a. SkyLiner® Safety Clip System, to include offset clip + fastener + banding, 16" either side of each frame. (Required for fall protection installation.)
  - b. Tek 2 and Tek 4.5.
- 9. Insulation Hangars.
  - a. SkyLiner® SkyHook™ for Walls.
  - b. SkyLiner® Insul-Hold for Walls, insulation hangars.

### **2.03 OTHER MATERIALS**

- A. Provide materials including fasteners and retainers, not specifically described but required for complete and proper installation of building insulation, selected by Contractor subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems have been tested and inspected.
- B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install liner system in accordance with manufacturer's installation instructions and approved shop drawings.
- B. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.
- C. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids, and any excess compression.

### **3.03 CLEANING**

- A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

### **3.04 APPENDIX**

- A. Refer to the Bay Insulation Systems publications listed below for product information, including uses, descriptions, physical properties, performance, specification compliance and application recommendations. Copies of these documents can be found at [www.bayinsulation.com](http://www.bayinsulation.com).
1. SkyLiner® New Construction Installation Instructions - Bay Publication 13290508.
  2. SkyLiner® New Construction Walls Installation Instructions - Bay Publication 13290509.
  3. SkyLiner® White Fabric Specification Sheet - Bay Publication 13290216.
  4. SkyLiner® Black Fabric Specification Sheet - Bay Publication 13290211.
  5. BayGrip™ for SkyLiner® Data Sheet- Bay Publication 13290306.
  6. BayGrip™ Spray for SkyLiner® Data Sheet- Bay Publication 13290307.

**END OF SECTION 07 21 16**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Provide vapor barrier and installation accessories for installation under concrete slabs.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Quality control/assurance:
  - 1. Summary of test results per paragraph 9.3 of ASTM E1745.
  - 2. Manufacturer's samples and literature.
  - 3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
  - 4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.
  - 5. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.
  - 6. Vapor barrier manufacturer must warrant in writing (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.
  - 7. Manufacturer's verify in writing 20 years in the industry with no reported product failures.

**1.04 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM E1745- 17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
  - 2. ASTM E1643-18a: Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. Technical Reference - American Concrete Institute (ACI):

1. ACI 302.2R-06: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
2. ACI 302.1R-15: Guide to Concrete Floor and Slab Construction.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Liner shall have all of the following qualities:
  1. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
  2. Other performance criteria:
    - a. Strength and Longevity: ASTM E1745.
    - b. Thickness: 15 mils minimum
  3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
  4. Warranty: (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.
- B. Vapor barrier product:
  1. Basis of Design: Stego® Wrap Vapor Barrier (15-mil) by Stego Industries LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com).
- C. Approved Alternate Manufacturers:
  1. Griffolyn® Vaporguard® 15-mil manufactured by Reef Industries, 800-231-6074.
  2. Moistop Ultra 15 by Fortifiber, (800) 773-4777.  
<https://www.fortifiber.com/product/moistop-ultra-15/>
  3. **No Other Substitutions allowed.**

### **2.03 ACCESSORIES**

- A. Seams:
  1. Stego Tape by Stego Industries LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)
- B. Sealing Penetrations of Vapor barrier:
  1. Stego Mastic by Stego Industries LLC, (877) 464-7834  
[www.stegoindustries.com](http://www.stegoindustries.com)
  2. Stego Tape by Stego Industries LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)
- C. Perimeter/terminated edge seal:
  1. Stego Crete Claw (textured tape) by Stego Industries LLC, (877) 464-7834  
[www.stegoindustries.com](http://www.stegoindustries.com)
  2. Stego Term Bar by Stego Industries LLC, (877) 464-7834  
[www.stegoindustries.com](http://www.stegoindustries.com)
  3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)

4. One-sided seaming tape is not a recommended method of sealing at the terminated edge.
- D. Penetration Prevention:
  1. Beast Foot by Stego Industries LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)
- E. Vapor Barrier-Safe Hand Screed System
  1. Beast Screed by Stego Industries, LLC, (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
  1. Level and compact base material.
- B. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.

### **3.02 INSTALLATION**

- A. Install vapor barrier in accordance ASTM E1643.
  1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
  2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
    - a. Seal vapor barrier to the entire slab perimeter using manufacturer's textured tape with a surface that creates a mechanical seal to freshly-placed concrete, per manufacturer's instructions.
  3. Overlap joints 6 inches and seal with manufacturer's seam tape.
  4. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.
  5. Seal all penetrations (including pipes) per manufacturer's instructions.
  6. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.
  7. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

**END OF SECTION 07 26 16**

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**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work Included: Furnish and install fluid-applied, vapor permeable weather barrier membrane, joint treatment, flashing, sealant and primers for flexible flashing and sheet flashing specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Product data:
  - 1. Submit manufacturer's product data and installation guidelines, including membrane and accessory material types, technical and test data, composition, descriptions and properties, installation instructions and substrate preparation requirements.
- D. Certificates:
  - 1. Certificates by manufacturer stating that manufacturer and installer meet qualifications as herein specified.
- E. VOC Certification: Submit certification that products furnished comply with regulations controlling use of volatile organic compounds (VOC).

**1.04 REFERENCES**

- A. The date of the standard is that in effect as the date of receipt of bids for the project.
- B. ASTM International (ASTM):
  - C 297-94 Test Method for Tensile Strength of Flat Sandwich Constructions in Flat wise Plane
  - C 578-01 Specification for Pre-formed Cellular Polystyrene Insulation Board
  - C 1177-08 Specification for Glass Mat Gypsum Substrate for Use as Sheathing
  - D 226-09 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

D 522-93a	Test Methods for Mandrel Bend Test of Attached Organic Coatings
D 1970-00	Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
D 3273-00	Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
D 4541-09	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
E 84-98	Test Method for Surface Burning Characteristics of Building Materials
E 96-00	Test Method for Water Vapor Transmission of Materials
E 119-98	Standard Test Methods for Fire Tests of Building Construction and Materials
E 330-10	Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
E 331-09	Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
E 779-10	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
E 783-02	Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
E 1186-03	Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems (2009)
E 1827-96	Standard Test Methods for Determining Air Tightness of Buildings Using an Orifice Blower Door (2007)
E 2178-03	Test Method for Air Permeance of Building Materials
E 2357-05	Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

## **1.05 PERFORMANCE REQUIREMENTS**

- A. Performance requirements: Comply with the specified performance requirements and characteristics as herein specified.
- B. Performance description:
  1. The building envelope shall be constructed with a continuous, air and water-resistive barrier to control air leakage, avoid condensation in the interior wall assembly and prevent water intrusion.
  2. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
  3. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the envelope without damage or displacement.
  4. System shall be installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations.

## **1.06 QUALITY ASSURANCE**

- A. Applicable standards, as referenced herein: ASTM International (ASTM).



- B. Manufacturer's qualifications: Air and water-resistive barrier systems shall be manufactured and marketed by a company with experience in the production and sales of air and water-resistive barrier system. Manufacturers proposed for use, but not named in these specifications, shall submit evidence of ability to meet all requirements specified.
- C. Installer's qualifications: The installer shall demonstrate qualifications to perform the work of this section by submitting the following:
  - 1. Verification that the installer completed SWR Institute's Validated Air Barrier Training and is approved to perform work as herein specified by air and water-resistive barrier system manufacturer.
- D. Inspection and testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover installed products or assemblies until they have been inspected, tested and approved.
- E. Sole source: Obtain materials within the scope of this specification from a single manufacturer.
- F. Regulations: Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOC).
- G. Mock-up:
  - 1. Prior to installation of the weather and air barrier system a field-constructed mock-up shall be applied to verify details and tie-ins, to demonstrate the required installation.
    - a. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window, door frame, sill, penetrations, insulation, flashing and any other critical junction.
    - b. Allow 72 hours for inspection and testing of mock-up before proceeding with weather and air barrier work.
    - c. Coordinate construction of mockups to permit inspection by Architect of air barrier before beginning installation.
    - d. Approved, undamaged mock-up must remain as part of the work.
- E. Pre-Installation Meeting: Convene before the start of installation of air and water-resistive barrier system.
  - 1. Require attendance of parties directly affecting work of this Section, including the Owner's Representative, Contractor, Architect, installing subcontractor, membrane system manufacturer's representative, roofing and foundation waterproofing subcontractors, and all subcontractors who have materials penetrating membrane system or finishes covering membrane system.
  - 2. Contractor shall notify Architect at least seven days prior to time for conference.
  - 3. Contractor shall record minutes of meeting and distribute to attending parties.
  - 4. Review the following:
    - a. Surface preparation.
    - b. Substrate condition and pretreatment.

- c. Minimum curing period.
- d. Special details and sheet flashing.
- e. Sequence of construction, responsibilities, and schedule for subsequent operations.
- f. Installation procedures.
- g. Inspection procedures.
- h. Protection and repair procedures.
- i. Review and approval of all glazing applications.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. Protect air and water-resistive barrier components from freezing and extreme heat.
- C. Sequence deliveries to avoid delays, and to minimize on-site storage.

#### **1.08 FIELD CONDITIONS**

- A. Environmental limitations:
  - 1. Comply with manufacturer's written instructions for substrate temperature and moisture content and other conditions affecting performance requirements.
- B. Weather conditions:
  - 1. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.
- C. Proceed with installation only when the substrate construction and preparation work are complete and in condition to receive the membrane system.
- D. Do not apply to frozen substrate. Allow adequate time for substrate to thaw, if freezing conditions exist before application.

#### **1.09 WARRANTY**

- A. Manufacturer's warranty requirements:
  - 1. Submit manufacturer's 5 year limited warranty stating:
    - a. The products have been tested in accordance with national standards for air and water-resistive barriers and passed those tests with effectiveness and durability indicating their suitability for performance as an air and water-resistive barrier system when properly applied.
    - b. The products shall be free from defects in material for a period of five years after the substantial completion of the material application.
    - c. That the products will not disintegrate and will maintain their integrity over the life of the warranty.

- B. Warranty period: Five (5) years from Date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Fluid applied air and water-resistive barrier that stops air and water leakage in cavity wall, masonry veneer construction, as well as in stucco, EIFS and most other building wall assemblies.
1. Product: PROSOCO R-Guard Spray Wrap MVP, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).
  2. Approved equal systems:
    - a. Carlisle
    - b. Henry Company; Air-Bloc 31MR; [www.henry.com](http://www.henry.com)
    - b. Sto Corporation
    - c. Tyvek, DuPont Building Innovations; 1-800-448-9835
    - d. W.R. Meadows AIR-SHIELD LMP; 1-800-342-5976
    - e. Soprema, 800-356-3521
    - f. Tremco EXOAIR® 230; 1-800-321-7906
    - g. GCP Applied Technologies; Perm-A-Barrier VPO; [www.graceconstruction.com](http://www.graceconstruction.com)
- B. Subject to compliance with the following physical and performance requirements:
1. ICC-ES AC 212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing.
  2. ABAA: Air Barrier Association of America Acceptance Criteria for Liquid Applied Membranes.
  3. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
  4. Water vapor transmission: 34 perms when tested in accordance with ASTM E96 (Wet Cup).
  5. Tensile bond: Minimum 15 psi or exceeds strength of substrate when tested in accordance with ASTM C297.
  6. Surface burning characteristics: Class A Building Material, when tested in accordance with ASTM E84. Flame Spread: Less than or equal to 25, Smoke Developed: Less than or equal to 450.
  7. Total solids: 68 to 72- percent by volume, ASTM-D-2369.

### **2.02 WATER BASED PRIMER FOR RAW GYPSUM BOARD EDGES**

- A. Primer to seal the cut edges of gypsum wall boards where they are exposed in rough openings for windows and doors. The sealed edge makes a compatible surface for easy application of liquid applied fiber-reinforced fill coat and seam treatment for through-wall components.
1. Product: PROSOCO R-Guard PorousPrep, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).

- B. Subject to compliance with the following physical and performance requirements:
  - 1. Breathable liquid primer.
  - 2. Comply with national, state and district AIM VOC regulations and be 100 g/L or less.
  - 3. Total solids: 16 percent.

### **2.03 LIQUID APPLIED FILL COAT AND SEAM FILLER**

- A. High modulus, gun-grade, crack and joint filler, adhesive and detailing compound that combines the best silicone and polyurethane properties. The single-component, Silyl-Terminated-Polymer (STP) prepares open joints, seams and cracks before installing primary water and air barrier system to prevent the movement of water and air through building envelopes.
  - 1. Product: PROSOCO R-Guard Joint & Seam Filler, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).
- B. Subject to compliance with the following physical and performance requirements:
  - 1. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
  - 2. Water vapor transmission: Minimum 19 perms at 20 mils when tested in accordance with ASTM E-96.
  - 3. Tensile strength: 70 psi when tested in accordance with ASTM D412.
  - 4. Elongation at break: Greater than 180 percent when tested in accordance with ASTM D412.
  - 5. Peel strength: Greater than 25 pli when tested in accordance with ASTM D1781.
  - 6. Total solids: 99 percent.

### **2.04 LIQUID-APPLIED FLASHING AND DETAILING MEMBRANE**

- A. Gun-grade, spread and tool or roller apply waterproofing, adhesive and detailing compound that combines the best of silicone and polyurethane properties. The single component, Silyl-Terminated-Polymer (STP) produces a highly durable, seamless, elastomeric should treat joints, seams, cracks and provide the flashing membrane in rough openings of structural walls and to counter-flash waterproofing and air barrier components.
  - 1. Product: PROSOCO R-Guard FastFlash manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).
- B. Subject to compliance with the following physical and performance requirements:
  - 1. AAMA 714-12 Voluntary Specification for Liquid-Applied Flashing Used to Create a Water-Resistive Seal Around Exterior Wall Openings in Buildings.
  - 2. ICC-ES AC 212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing.
  - 3. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
  - 4. Water vapor transmission: 21 perms when tested in accordance with ASTM E96.

5. Tensile strength: Greater than 150 psi when tested in accordance with ASTM D412.
6. Elongation at break: Greater than 350 percent when tested in accordance with ASTM D412.
7. Total Solids: 99 percent.

## **2.05 INTERIOR SEALANT FOR WINDOWS AND DOORS**

- A. High performance, gun-grade waterproofing sealant that combines the silicone and polyurethane properties. Single component, Silyl-Terminated-Polymer (STP) that is that is durable, and stops the movement of moist air through cracks surrounding windows and doors.
  1. Product: PROSOCO R-Guard AirDam, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).
- B. Subject to compliance with the following physical and performance requirements:
  1. Comply with national, state and district AIM VOC: less than 30 grams per Liter.
  2. Sealant Validation from Sealant Waterproofing & Restoration Institute (SWRI).
  3. Elongation at break: Greater than 1000% when tested in accordance with ASTM D412.
  4. Peel strength: 25 pli when tested in accordance with ASTM C794
  5. Total solids: 98 percent.
- C. Backer rod: In deep joints, control sealant depth by installing closed cell backer rod. Diameter of the soft-backer rod should be 25 percent greater than the joint width. Do not puncture backer rod.

## **2.06 PREFORMED SILICONE SEALANT EXTRUSION**

- A. Manufacturer's standard system consisting of pre-cured low modulus elastomeric extrusion that provides a continuous transition and bridges windows and door frames at curtain wall, storefront, expansion joints, roof to air barrier materials. Provide continuous Preformed Silicone Sealant Extrusion System that is flexible, durable, designed for high dynamic and thermal movement which is resistant to ultraviolet exposure and weathering.
  1. Product: PROSOCO R-Guard SureSpan EX, manufactured by PROSOCO Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com).
- B. Subject to compliance with the following physical and performance requirements:
  1. Elongation: Minimum 400 percent when tested in accordance to ASTM D412.
  2. Joint Movement Capacity: Minimum 200 percent elongation and minimum 75% compression per ASTM C1518 (ASTM C1523).
  3. Tensile Strength: Minimum 700 psi when tested in accordance with ASTM D412.
  4. Tear Strength: Minimum 200 lb/in when tested in accordance with ASTM D624.

5. Tear Propagation: Pass testing requirements of ASTM C1518 (ASTM C1523). Movement Class shall exceed 200 percent Elongation and a Tear Class of PT (Knotty Tear).
6. Shore Hardness A: 50 to 65 when tested in accordance with ASTM D2240.
7. UV Resistance: No degradation of material when exposed to UV.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION AND SURFACE PREPARATION**

- A. Examine conditions for compliance with system manufacturer's requirements for installation, and other specific conditions affecting performance of air barrier system.
- B. All surfaces must be sound, clean and free of grease, dirt, excess mortar or other contaminants. Fill or bridge damaged surfaces, voids or gaps larger than one- inch. Fill voids and gaps measuring one- inch or less with liquid applied fill coat and seam filler as necessary to ensure continuity.
  1. Surfaces to receive primary fluid applied air and water barrier must be dry or damp, unless approved by air barrier manufacturer. Surfaces to receive (STP) fluid applied accessories must be dry, damp or wet to the touch. Brush away any standing water present before application. STP products will tolerate rain immediately after application.
- C. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
  1. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
  2. Remove contaminants such as grease, oil and wax from exposed surfaces.
  3. Remove dust, dirt, loose stone and debris.
  4. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
  5. Refer to manufacturer's product data sheets and manufacturer's installation guidelines for additional information on preparing structural walls to receive the primary air and water resistive barrier.
- D. Exterior sheathing:
  1. Ensure that sheathing is properly installed with ends, corners and edges properly fastened. Remove and replace damaged sheathing.
  2. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing, and spot overdriven fasteners with liquid applied fill coat and seam filler.
  3. Seal the cut edges of gypsum wall boards exposed in rough openings for windows and doors at corners, as recommended by manufacturer.
- E. Masonry and concrete substrates:
  1. Masonry head and bed joints should be fully filled and tooled.

2. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and debris.
3. Fill cracks, joints and gaps with liquid applied fill coat and seam filler as herein specified.

### **3.02 FIBER REINFORCED FILL COAT AND SEAM FILLER**

- A. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid applied fill coat and seam filler for seams, joints, cracks, gaps, primed rough gypsum edges at sheathing, rough openings per manufacturer's written instructions.

### **3.03 LIQUID APPLIED FLASHING AT WINDOWS, DOORS, OPENINGS AND PENETRATIONS**

- A. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid flashing membrane over surfaces to seal and waterproof rough openings per manufacturer's written instructions. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply additional coats as needed to achieve void- and pinhole-free surface.

### **3.04 FLUID-APPLIED AIR & WATER-RESISTIVE BARRIER INSTALLATION**

- A. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply air and water-resistive barrier to a clean, dry substrate within temperature and weather limitations per manufacturer's written instructions.
  1. Apply to recommended thickness.
  2. Allow product to cure and dry.
  3. Inspect membrane before covering. Repair any punctures or damaged areas by applying additional material.
  4. Back roll as necessary to ensure there are no pinholes, voids or gaps in the membrane. Apply fluid applied air and water-resistive barrier per manufacturer's recommendations.
  5. Apply additional coats per manufacturer's written instructions.

### **3.05 FLUID-APPLIED FLASHING TRANSITIONS**

- A. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.

- B. Apply fiber reinforced fill coat and seam filler and liquid flashing membrane as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials per manufacturer's written instructions.
  - 1. Fill any voids between the top of the flashing leg and the vertical wall with fiber reinforced fill coat and seam filler.
  - 2. Spread the wet liquid flashing membrane to create a monolithic "cap-flash" flashing membrane per manufacturer's written instructions.
  - 3. Apply additional coats as needed to achieve void- and pinhole-free surface.
  - 4. Allow treated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.
  
- B. Apply preformed silicone sealant extrusion to provide a continuous airtight and water-tight seal between material frame and substrate per manufacturer's written instructions.
  - 1. Embed material in bead of liquid flashing membrane per manufacturer's written instructions.

### **3.06 INTERIOR SEALANT FOR WINDOWS AND DOORS INSTALLATION**

- A. General: Comply with weather and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
  
- B. Apply interior waterproofing sealant per manufacturer's written instructions.
  - 1. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Install Backer Rod as necessary per manufacturer's written instructions.
  - 2. Apply interior waterproofing sealant in continuous beads without gaps or air pockets.

**END OF SECTION 07 27 26**



**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. This section covers the pre-finished, pre-fabricated Architectural standing seam roof system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
- B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.
- C. Related Work Specified Elsewhere
  - 1. Roof Deck structural steel, flat roof systems, perimeter edge systems. Roof hatches, firestopping not included in this section.
- D. Material to comply with:
  - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
  - 1. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.
- C. Shop drawings: Show fabrication and installation layouts of metal roof panels, metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
- D. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, base don input from installer of the items involved:
  - 1. Roof panels and attachments

2. Metal trusses, bracings and supports
3. Roof-mounted items including snow guards and items mounted on roof curbs.

#### **1.04 DEFINITIONS**

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight roofing system.
- B. References:
  1. American Society for Testing and Materials (ASTM)
    - a. ASTM A 653: Steel Sheet, Zinc Coated by the Hot Dip Process
    - b. ASTM A 792: Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process
    - c. ASTM B 209: Aluminum and Aluminum Alloy Sheet and Plate
    - d. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction
  2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
    - a. SMACNA Architectural Sheet Metal Manual, 1993 edition
  3. American Iron and Steel Institute (AISI)
    - a. AISI Cold Formed Steel Design Manual
  4. Aluminum Association
    - a. Aluminum Design Manual
  5. Metal Construction Association
    - a. Preformed metal Wall Guidelines
  6. Code References
    - a. ASCE, Minimum Loads for Buildings and Other Structures
    - b. BOCA National Building Codes
    - c. UBC Uniform Building Code
    - d. SBC Standard Building Code

#### **1.05 ROOF SYSTEM PERFORMANCE TESTING**

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
- B. Roof System shall be designed to meet Standard Building Code Wind Load requirements.
- C. Panels to meet:
  1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.
  2. Roof System shall be designed to meet a UL Class 90 wind uplift in accordance with UL standard 580 and panel system shall be ASTM 1592 Tested and approved
  3. UL 2218 - Impact Resistance rated.

## **1.05 QUALITY ASSURANCE**

- A. Petersen Aluminum Corp, Tyler, TX, 800-441-8661 products establish a minimum of quality required.
- B. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
- C. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

## **1.05 PRE-INSTALLATION CONFERENCE**

- A. Prior to installation of roofing system, conduct a pre-installation conference at the project site.
- B. Attendance: Owner, Architect, Contractor, Project Superintendent, and Certified Installer.
- C. Agenda:
  - 1. Roofing details and agenda
  - 2. Critical work sequencing and review of phasing plan
  - 3. Inspection sequencing

## **1.06 WARRANTY**

- A. Weathertight warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: 20 Years from date of Substantial Completion
- B. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.
  - 1. Exposed Panels Finish - deterioration includes the following:
    - a. Color fading more than 5 hunter units when tested according to ASTM D 2244
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
    - c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
  - 2. Warranty Period: 20 Years from the date of substantial completion
- C. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

## **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal roof panels and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- C. Unload, store and erect metal roof panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting or other surface damage.
- E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

## **1.07 COORDINATION**

- A. Coordinate sizes and locations of roof curbs, equipment supports and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim and construction of decks, parapet walls and other adjoining work to provide a leakproof, secure and non-corrosive installation.

## **PART 2 - PRODUCTS**

### **2.01 PANEL DESIGN**

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates and accessories required for a weathertight installation.
- B. Roof panels shall be standing seam Tite-Loc in 16" widths with 2" high seams that are mechanically seamed together @ 90 degrees.
  - 1. Curving Option: Roof panels may be "field-curved/radiused" with the Factory-Supplied Curving Machine to achieve the proper installation of these panels on the radiused/curved roofs on this project
- C. Panels to be produced with Factory supplied hot melt mastic in the seams.

- D. Panels to be produced Smooth - Factory Standard.
- E. Panels to be designed for attachment with concealed fastener clips, spaced as required by the manufacturer to provide for both positive and negative design loads, while allowing for the expansion and contraction of the entire roof system resulting from variations in temperature.
- F. Forming: Use continuous end rolling method. No end laps on panels. No portable roll-forming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.

## **2.02 ACCEPTABLE MANUFACTURERS**

- A. This project is detailed around the roofing product of Petersen Aluminum Corporation Petersen Aluminum Corp, Tyler, TX, 800-441-8661, Tite-Loc.
- B. Approved equivalent system by one of the following manufacturers will be considered:
  - 1. AEP Span
  - 2. Berridge
  - 3. Exceptional Metals
  - 4. McElroy Metal
  - 5. Metal Sales
  - 6. MBCI

## **2.03 MATERIALS AND FINISHES**

- A. Preformed roofing panels shall be fabricated of 24 GA Steel
- B. Color to be selected by Architect from manufacturer's complete line.
- C. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
- D. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
- E. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.

- F. Closures: use composition or metal profiled closures at the top of each elevation to close ends of the panels. Metal closures to be made in the same material and finish as face sheet.
- G. Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates.
- H. Substrate shall be 2 x 6 Tongue & Groove SYP wood decking.
- I. Roofing Underlayment
  - 1. On all surfaces to be covered with roofing material, furnish and install a 40 mil Peel & Stick membrane, required as outlined by metal panel manufacturer. Membrane to be a minimum of 40 mil thickness, smooth, non-granular, high temperature. Basis of design: Carlisle WIP 300 HT High Temperature Protection Self Adhering Roofing Underlayment. Other acceptable manufacturers include:
    - a. W.R Grace "Ice & water Shield"
    - b. Interwrap Titanium PSU-30
    - c. Carlisle CCW WIP 300HT
    - d. Interwrap Titanium PSU
    - e. Tamko TW Tile and Metal Underlayment
  - 2. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6, and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.
  - 3. Peel and Stick Underlayment shall lap all hips and ridges at least 12" to form double thickness and shall be lapped 6" over the metal of any valley or built-in gutters and shall be installed as required by the Standing Seam Panel Manufacturer to attain the desired 20-Year Weathertightness Warranty.
- J. Sealants
  - 1. Exterior grade silicone sealant recommended by roofing manufacturer.

## **2.04 FABRICATION**

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

## **2.05 SNOW RETENTION SYSTEM**

- J. Snow Retention System:
  - 1. Provide PAC\_Clad ColorGard utilizing the patented S-5! Clamp for its strength. S-5! utilizes round-point set screws for attachment which are specially made for the S-5! ColorGard or SnoFence™ snow retention system.
  - 2. Finish: Components to match the same paint finish color as the metal roof panels.

## **2.06 GUTTERS AND DOWNSPOUTS**

- A. Provide 24 gauge steel 6" PAC-Tite Gold Gutter Profile IGG-B, color to match roof panel. Include 30-Year Kynar 500® Finish Warranty on coil-coated standard colors.
  - 1. Include 2" wide external wind strap to be installed every 6' and gutter straps every 24" O.C. to comply with the ANSI/SPRI GT-1 Standard.
  - 2. Include heavy aluminum gutter strap design that eliminates the need for drilling and riveting. Free-floating, hook-in strap allows for full thermal movement of the gutter. Provide roof flange.
- B. Provide PAC-Tite LT Corrugated Downspout, color to match roof panel. Include 30-Year Kynar 500® Finish Warranty on coil-coated standard colors.

## **2.07 SOFFIT PANELS**

- A. Provide Artisan® Series by MBCI, or approved equal, 1" deep x 12" [8"] [10"] wide, rollformed from 26 gauge, G-90 Galvanized (ASTM A525) sheet steel having a minimum yield of 37,000 psi. Provide perforated aluminum with 1/8" round holes on 0.324" staggered centers to achieve 13.5% open area as required for 20% of the total installation.
- B. Provide panels with male and female side configurations to form a locking assembly when joined to adjacent panels. Provide manufacturer's standard concealed attachment method.
- C. Finish to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation. Color to be selected by Architect from manufacturer's standard line.

## **2.09 SNOW AND ICE RETENTION SYSTEM**

- A. Snow Retention System:
  - 1. Provide 1" Sno Blockade™ Snow Retention System by Sno Gem, (1-888-766-4367) with the Sno Gem Sno Cube™ attachment bar system and "Blockade Plate™ for sliding snow and ice, spaced as recommended by manufacturer. Provide clamp style to coordinate with roof seam profile being proposed. Provide installation details to Architect for review prior to installation.
  - 2. Finish: Components to match the same paint finish color as the metal roof panels.
  - 3. Approved Equal Manufacturers:
    - a. S-5! ColorGard by Metal Roof Innovations, Ltd., 888-825-3432.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.
- B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 FASTENERS**

- A. Secure units to supports
- B. Place fasteners as indicated in manufacturer's standards.

### **3.03 INSTALLATION**

- A. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
- B. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
- C. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

### **3.04 DAMAGED MATERIAL**

- A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

**END OF SECTION 07 41 13**



**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. This Section covers the pre-finished, prefabricated Factory Manufactured Architectural Concealed Attachment Metal Wall system. All metal trim, accessories, fasteners, insulation, and sealants indicated on the drawings as part of this section.
- B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.
- C. Related Work Specified Elsewhere
  - 1. Roof Deck structural steel, flat roof systems, preformed metal standing seam roofing, perimeter edge systems, roof hatches, firestopping not included in this section.
- D. System Description:
  - 1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop drawings: Show fabrication and installation layouts of metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work.
- D. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturers:
  - 1. Petersen Aluminum Corp products establish a minimum of quality required, Tyler, TX, 800-441-8661
  - 2. MAC Metal Architectural, distributed by Acme Brick, (501) 812-5574.
  - 3. McElroy Metals, Bossier City, LA 71111. Tel.: (800) 562-3576.
- B. The manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
- C. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual and National Roofing Contractors Association (NRCA) details applicable to wall panels and wall flashings.
- D. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted

#### **1.05 WALL PANEL SYSTEM PERFORMANCE TESTING**

- A. Air Penetration: When tested per ASTM E-283 @ 6.24 PSF the air penetration shall be .005 or less when tested in accordance here.
- B. Water Penetration: When tested per ASTM E-331 @ 12.48 PSF for the 15-minute test period, the water penetration shall be none.
- C. Dynamic Water Penetration: When tested per AAMA 501 @ 15 PSF, the water penetration shall be none.
- D. Structural Performance: When tested per ASTM E 1592, withstand the effects of wind loads and deflection limits of the span as indicated on the drawings.
- E. Negative Load Testing per ASTM E-330: The panel shall have been tested per ASTM E-330 to show negative wind uplifts at spans of 1 through 4 spans, both double and triple spans and the Manufacturer shall provide a Negative Wind Uplift Table for this panel at the above-listed spans, with current 2.0 Safety Factor as per IBC current code and 1.65 Safety Factor as per US Corps of Engineers.

#### **1.06 SUMMARY**

- A. Section Includes
  - 1. Factory formed metal wall and soffit panels.
- B. Related work specified elsewhere:
  - 1. Metal Roof Deck: Section 05 30 00 - Metal Decking.
  - 2. Wood Framing and Decking: Section 06 10 00 - Rough Carpentry.

3. Flashing and Trim: Section 07 60 00 - Flashing and Sheet Metal.
4. Coping and Gravel Stops: Section 07 71 13 - Manufactured Coping.
5. Sealants: Section 07 92 00 - Joint Sealants.

## **1.07 PRODUCT HANDLING**

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal soffit panels and other manufactured items so as not to be damaged or deformed. Package metal soffit panels for protection during transportation and handling.
- C. Unload, store and erect metal soffit panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering.
- E. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
- F. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

## **1.08 WARRANTIES**

- A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
  1. Exposed Panels Finish deterioration includes the following:
    - a. Color fading more than 5 hunter units when tested according to ASTM D 2244 (varies for Award Blue/Cardinal Red).
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214 (varies for Award Blue/Cardinal Red).
    - c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
  2. Warranty Period:
    - a. 30 Years from the date of substantial completion.

## **PART 2 - PRODUCTS**

### **2.01 PANEL DESIGN**

- A. Provide factory-formed wall panels that shall be concealed attachment in nominal 12" width with 1 3/8" high panel corrugations that are mechanically attached to wall supports and do not have any exposed fasteners on the panel face for attachment to the wall

supports. Panels can be specified with extended fastening leg.

- B. Architect to select from the following:
1. **MP-1:** PAC Precision Series Box Rib 3 and Box Rib 4, 12" wide, 1 3/8" high, double reveal profile with raised flat pan and concealed extended fastener leg.
  2. **MP-2:** MAC Metal Formed Steel Wall Panels, PolyMAC Series.
  3. **MP-3:** MAC Metal Formed Steel Soffit panels, PolyMAC Series.
  4. **MP-4:** MAC Metal Formed Steel Wall Panels, PolyMAC Series.
  5. **MP-5:** McElroy Metals, Concealed Fastener Formed Metal Wall Panels, "Wave".

## 2.02 MATERIALS AND FINISHES

- A. Preformed metal panels shall be fabricated of 24 GA and 22 GA G-90 Galvanized steel.
- B. Color shall be selected by the architect from manufacturer's complete line.
- C. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over 0.25 to 0.31 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil. The bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
- D. Field protection must be provided by the Contractor at the job site so material is not exposed to weather and moisture.
- E. Forming: use continuous and rolling method. No portable roll-forming machines will be permitted on this project; no installer-owned or installer-rented machines shall be permitted. It is the intent of the Architect to provide Factory-Manufactured wall panel systems only for this project.
- F. Trim: Trim shall be fabricated of the same material and finish to match the profiled sheeting and press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
- G. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system.
- H. Exposed fasteners shall not restrict free movement of the wall panel system resulting from thermal forces, except at designed points of wall panel fixity. May require the use of PAC factory clips to alleviate thermal movement for panels over 20' in length. Consult PAC factory on use of wall panel clips.

- I. Closures: Use composition or metal profiled closures at top of each elevation to close ends of the panels. Metal closures to be made in the same material and finish as face sheet.
- J. Fasteners: Fasteners shall be galvanized steel, dished washers, galvanized steel with bonded neoprene.
- K. Zees: Where required by design of primary structural framing system shall be used to span as required to withstand wind loads.
- L. Insulation: See Section 07 21 00 - Thermal Insulation.
- M. Sealants
  - 1. Exterior grade silicone sealant recommended by manufacturer.

### **2.03 FABRICATION**

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown and, if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire and performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standards, and according to manufacturer's instructions.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine alignment of structural steel and related supports prior to installation and do not proceed until the defects are corrected by the responsible contractor.
- B. For the record, prepare a written report, endorsed by the installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 FASTENERS**

- A. Secure units to supports.
- B. Place fasteners as indicated in manufacturer's standards.

### **3.03 INSTALLATION**

- A. Panels shall be installed plumb and true in proper alignment and relation to the structural framing. The erector must have at least five years' successful experience with similar applications.
- B. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be by manufacturer's installation instructions and details for this wall panel system
- C. Remove all strippable coating and provide a dry wipe-down cleaning of the panels as they are erected.

### **3.04 DAMAGED MATERIAL**

- A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

**END OF SECTION 07 41 20**

**PART 1 GENERAL****1.01 SUMMARY**

- A. Furnish and install elastomeric membrane sheet roofing system, including:
  - 1. Roofing manufacturer's requirements for the specified warranty.
  - 2. Preparation of roofing substrates.
  - 3. Wood nailers for roofing attachment.
  - 4. Insulation.
  - 5. Cover boards.
  - 6. Elastomeric membrane roofing.
  - 7. Specially coated fastener plates and fasteners.
  - 8. Metal roof edging and coping.
  - 9. Flashing.
  - 10. Walkway pads.
  - 11. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.
  
- B. Disposal of demolition debris and construction waste is the responsibility of contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
  
- C. Comply with the published recommendations and instructions of the roofing membrane manufacturer.
  
- D. Commencement of work by the Contractor shall constitute acknowledgment by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

**1.02 REFERENCES**

- A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
  
- B. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2004.
  
- C. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
  
- D. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2009.
  
- E. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 2010.

- F. ASTM D 1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2009.
- G. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000.
- H. ASTM D D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2011a.
- I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
- J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- K. FM 1-28 - Design Wind Loads; Factory Mutual System; 2007.
- L. FM 1-29 - Roof Deck Securement and Above Deck Roof Components; Factory Mutual System; 2006.
- M. PS 1 - Construction and Industrial Plywood; 2009.
- N. PS 20 - American Softwood Lumber Standard; 2010.
- O. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011. (ANSI/SPRI/FM 4435/ ES-1-11).
- P. OSHA 1926-Subpart M: 1926.502 - Fall Protection Systems Criteria and Practices (Safety and Health Regulations for Construction).
- Q. OSHA 1910 Subpart D - Walking-Working Surfaces
- R. ANSI A10.32-2012: Personal Fall Protection Used in Construction and Demolition Operations.
- S. ANSI/ASSP Z359 Fall Protection and Arrest Standards Package.
- T. ASSP American Society of Safety Professionals
- U. National Roofing Contractors Association (NRCA): Manual 19 - The NRCA Roofing Manual: Membrane Roofing Systems.

### **1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Product Data:



1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
  2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system. A verification letter from the system manufacturer will suffice.
  3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- D. **Samples: Submit actual material samples of each product to be used. Sell sheets and digital submissions will not be considered for color selections.**
- E. Specimen Warranty: Submit prior to starting work.
- F. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- G. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- H. Safety Plan Submittal: The roofing contractor shall develop and implement an alternative fall protection plan which meets the requirements stipulated in OSHA standards 1926.501(b) (13) if guardrail systems, personal fall arrest systems (PFAS), and safety net systems are impossible or not feasible, or if they create a more significant hazard.

#### 1.04 QUALIFICATIONS

- A. Manufacturer:
1. Company providing a no dollar limit, single source roof system warranty that is backed by corporate assets.
  2. Manufacturer must be able to provide the project with the polyisocyanurate insulation that is produced in their facilities.
- B. Applicator:
1. Shall have experience in installing heat welded system.
  2. Shall be a Firestone Red Shield Licensed Contractor.
  3. Shall have completed at least three (3) projects of this size and scope within the last five (5) years.

#### 1.05 QUALITY ASSURANCE

- A. Pre-Installation Conference: Before start of roofing work, shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.

2. Notify Architect well in advance of meeting.
- B. Manufacturer's Field Representative:
1. Manufacturer's full time technical employee or independent roofing inspector.
  2. Individual certified by Roof Consultants Institute as Registered Roof Observer.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.
- D. Test Reports:
1. Roof drain and leader test or submit plumber's verification.
  2. Core cut, if required.
  3. Roof deck fastener pullout test, if required.
- E. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

#### **1.07 WARRANTY**

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Manufacturer Warranty: Firestone 20 year [ **30 Year** ] Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
  1. Limit of Liability: No dollar limitation.
  2. Scope of Coverage: Repair leaks in the roofing system caused by:
    - a. Ordinary wear and tear of the elements.
    - b. Manufacturing defect in manufacturer's brand materials.
    - c. Defective workmanship used to install these materials.
    - d. Damage due to winds up to 72 mph.
    - e. No exclusion for lack of roof maintenance inspections.
    - f. No exclusion for exposure to post installation sustained high temperatures.
  3. Not Covered:
    - a. Damage due to winds in excess of 72 mph.
    - b. Damage due hurricanes or tornadoes.
    - c. Hail.
    - d. Intentional damage.
    - e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

- C. General Contractor and Roofing Subcontractor: Required to jointly and separately provide written guarantee that the roofing and flashing will be weather-tight and free from defects in materials and workmanship for a period of 2 years from Final Acceptance Date.
1. Leaks and defects include blistering, fish-mouths, ridging, splits, open laps, buckles, wrinkles and slippage. Make corrections at Contractor's expense during guarantee period.
  2. Roofing inspection and written acceptance by manufacturer, Architect, and Owner will be required. In addition, roofing subcontractor is to schedule a joint inspection by above named parties 60 days prior to expiration of 2 year guarantee and correct defects complying with original specifications.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis-of-Design - Roofing System: Firestone Building Products Co., Carmel, IN. [www.firestonebpco.com](http://www.firestonebpco.com) or approved equal.
1. Alternate roofing systems allowed:
    - a. Carlisle SynTec
    - b. GAF Materials Corporation
    - c. Johns Manville

### **2.02 ROOFING SYSTEM DESCRIPTION**

- A. Roofing System:
1. Membrane Type: Reinforced Ultraply™ TPO or approved equal.
  2. Thickness: As specified elsewhere.
  3. Membrane Attachment: Fully Adhered.
  4. Comply with applicable local building code requirements.
  5. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
  6. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating.
  7. Color: **Grey**
- B. Insulation:
1. Minimum R Value: R-26 LTTR, continuous insulation.
  2. Base Layer: Polyisocyanurate foam board, non-composite.
    - a. Attachment: Loose laid, no attachment.
- C. Cover Board:
1. Type: Gypsum-based board, 1/4-inch thick.
  2. Attachment: Mechanically Attached.

## 2.03 TPO MEMBRANE MATERIALS

- A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
1. Thickness: 0.060 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch plus/minus 10 percent.
  2. Sheet Width: Provide sheets of width necessary to accommodate batten spacing required by manufacturer for project conditions.
  3. Puncture Resistance: 265 lbf (1174 N), minimum, when tested in accordance FTM 101C Method 2031.
  4. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C 1549.
  5. Color: **Grey**
  6. Acceptable Product: UltraPly™ TPO by Firestone or approved equal.
- B. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches wide.
- C. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 0.060 inch plus/minus 10 percent.
  2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D 638 after heat aging.
  3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
  4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D 1004 after heat aging.
  5. Color: **Grey**
  6. Acceptable Product: UltraPly™ TPO flashing by Firestone or approved equal.
- D. Tape Flashing: 5-1/2 inch nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch nominal; TPO QuickSeam Flashing by Firestone.
- E. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone or approved equal.
- F. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- G. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick; Firestone Termination Bar by Firestone or approved equal.
- H. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone or approved equal.
- I. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; UltraPly TPO General Purpose Sealant by Firestone or approved equal.

- J. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Firestone or approved equal.
- K. TPO Coated Metal: Galvanized Steel with manufacturer's bonded TPO Coating, UltraPly TPO Coated Metal by Firestone or approved equal, in color by architect.
- L. Contractor Option: Ultraply™ TPO Invisiweld™ System may be incorporated.
- M. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch by 30 inches by 50 feet long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Firestone or approved equal.
- N. Yellow Safety Strip: To designate areas of caution on the roof or around rooftop objects. 5.5 inches wide (140 mm) by 100 feet long strip and nominal 30 mil thick yellow TPO membrane laminated to a white, cured, seam tape. Compatible with TPO and EPDM; QuickSeam Yellow Safety Strip by Firestone or approved equal.

## 2.04 ROOF DECK INSULATION

- A. Provide Firestone ISO 95+™ GL, Atlas ACFoam II or approved equal polyisocyanurate roof deck insulation, with black glass reinforced felt facers accepted by Factory Mutual for use in Class I Construction as described in the current edition of the FMRC Approval Guide (tested to FM 4450 standard). Provide in largest board size practical to minimize joints. Product must have water vapor transmittance of less than 1.0 perm, density must be 2 pcf minimum, compressive strength must be 20 psi minimum with dimensional stability of 2% or less and maximum flame spread of 25 (core). Provide in thickness required to achieve minimum **R-26** LTTR minimum continuous insulation rating.
  - 1. Provide tapered insulation as required to achieve positive drainage.
- B. All packages and containers of foam plastic and foam plastic ingredients shall bear the label of an approved agency showing either the flamespread rating and smoke developed rating of the product at the thickness tested or the use for which the product has been listed.
- C. All foam plastic or foam plastic cores in manufactured assemblies used in building construction shall have a flamespread rating of not more than 75 and shall have a smoke developed rating of not more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E84.
- D. The potential heat of foam plastic in any portion of the assembly shall not exceed 6000 Btu/Sq. Ft. of projected area as described by tests conducted in accordance with NFPA 259.
- E. Foam plastic insulation, exterior coatings and facings tested separately shall each have a flamespread rating of 25 or less and a smoke developed rating of 450 or less as determined in accordance with ASTM E84.

- F. Results of diversified or full scale fire tests reflecting an end use configuration shall be submitted to the Building Official demonstrating the assembly in its final form does not propagate flame over the surface or through the core when exposed on the exterior face to a fire source.
- G. The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number of definitive information describing the product or materials performance characteristics and approved agency's identification.

## **2.05 ROOF DECK INSULATION COVER BOARD**

- A. Gypsum-Based Cover Board (1/4-inch DensDeck® Prime): Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C 1177/C 1177M, and with the following additional characteristics:
  - 1. Size: 48 inches by 96 inches, nominal.
    - a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
  - 2. Thickness: As indicated elsewhere.
  - 3. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C 473.
  - 4. Spanning Capability: Recommended by manufacturer
  - 5. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E 84.
  - 6. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
  - 7. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D 3273 for minimum of 4 weeks.
- B. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

## **2.05 METAL FLASHING**

- A. Edge Metal and/or Coping:
  - 1. Description: Provide prefabricated or shop fabricated 24 gauge steel with Kynar finish in manufacturers standard colors to be selected by owner. Edge metal must meet FM wind uplift requirements and have ANSI/SPRI ES-1 test approval.
- B. TPO Coated Metal utilized for edge flashing at fascia or where exposed to direct view shall be in a color approved by the architect.

## **2.06 ACCESSORY MATERIALS**

- A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated in accordance with Section 06 10 00.
  - 1. Width: 3-1/2 inches nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.

2. Thickness: Same as thickness of roof insulation.

## **2.07 MISCELLANEOUS**

- A. Roof Walkway Pads:
  1. Description: Non-reinforced ULTRAPLY TPO Walkway Pads, 0.13" x 30" x 50' with Patterned traffic bearing surface or approved equal.
- B. Ultraply™ TPO Molded inside corners or approved equal.
- C. Ultraply™ TPO Molded outside corners or approved equal.
- D. Ultraply™ TPO Molded pipe boots or approved equal.
- E. Ultraply™ TPO T-Joint Covers or approved equal.
- F. Ultraply™ TPO Invisiweld™ System or approved equal.

## **PART 3 INSTALLATION**

### **3.01 GENERAL**

- A. Install roofing, insulation, flashing, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashing, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
  1. Protect from spills and over-spray from bitumen, adhesives, sealants and coatings.
  2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne over-spray.

3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

### **3.02 EXAMINATION**

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

### **3.03 PREPARATION**

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

### **3.04 INSULATION AND COVER BOARD INSTALLATION**

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- C. Lay roof insulation in courses parallel to roof edges.



- D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.
- E. Loose Laid Installation: Install insulation by laying loose over substrate without mechanical securement of any kind.
- F. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

### **3.05 ELASTOMERIC MEMBRANE INSTALLATION**

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

### **3.06 FLASHING AND ACCESSORIES INSTALLATION**

- A. Install flashing, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
- B. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.
- C. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.
- D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
  - 1. Use the longest practical flashing pieces.
  - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
  - 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
  - 4. Provide termination directly to the vertical substrate as shown on roof drawings.
- E. Roof Drains:
  - 1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.

2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
  3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
  4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
  5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashing wherever practical; otherwise use specified self-curing elastomeric flashing.
  2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1 inch clearance from penetration, sloped to shed water.
  3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.
  4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
  5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F, protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

### **3.07 FINISHING AND WALKWAY INSTALLATION**

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

### **3.08 FIELD QUALITY CONTROL**

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Fastener Pull Out Tests: ANSI/SPRI FX 1; one test for every 2,500 square feet of deck. Perform tests for each combination of fastener type and roof deck type before installing roof insulation.
- a. Test at locations selected by Owner's Representative.
  - b. Do not proceed with roofing work when pull out resistance is less than manufacturer's required resistance.
  - c. Test Results:
    - 1) Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.
    - 2) Patch cementitious deck to repair areas of fastener tests holes.

- C. Perform all corrections necessary for issuance of warranty.

### **3.09 CLEANING**

- A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

### **3.10 PROTECTION**

- A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

**END OF SECTION 07 54 23**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install metal flashing and sheet metal work specified.
  - 1. Flashing and Counter-flashing
  - 2. Gutter with Gutter Guard, Downspouts and Splashblocks
  - 3. Drip Edge
  - 4. Trim
  - 5. Cricket
  - 6. Chase Cover
  - 7. Other work indicated and required by project

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Job Supervision: Applicator of work in this Section to furnish competent, qualified foreman present and in charge at all times work is performed.
- B. Applicable Standards:
  - 1. ANSI/SPRI/FM 4435/ES-1-11 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems", and NRCA Guidelines for Complying With Building Codes Using ANSI/ SPRI ES-1. Provide shop drawings, to include wood blocking, to meet this standard or certified third party test data for gravel stop, fascia profiles and coping. Refer to the drawings for design wind load parameters. Include wind loads for roof area perimeters and corners on submittals.
  - 2. Refer to the current edition of the "Architectural Sheet Metal Manual" of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). Use as applicable standard for method and quality of work under this Section where not specifically otherwise shown in Contract Documents. Manufacturer to provide trained metal craftsmen to supervise installation.

3. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
4. ANSI/SPRI GT-1 2016 (R2022) - Test Standard for External Gutter Systems per Arkansas Code or the 2021 International Building Code.

## **1.05 WARRANTY**

- A. Provide manufacturer's guarantee for exterior color finish for a period of 20 years against blistering, peeling, cracking, flaking, checking, chipping and excessive color change and chalking. Color change not to exceed 5 NBS units (per ASTM D-2244.64T) and chalking not less than rating of 8 per ASTM D-659.
- B. Guaranty: Guaranty sheet metal work installed under this Section against leakage or defects for 2 years after substantial completion date. Make good at Contractor expense leakage or defects occurring within this period.

## **PART 2 - PRODUCTS**

### **2.01 SHEET METAL**

- A. G-60 Galvalume Steel: Aluminum-zinc alloy coating AZ50, meeting ASTM A792. Keep Galvalume dry during transit, in storage, and at work site.
  1. At locations where flashing is visible from outside building, finish to be Kynar 500® based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's complete line.
    - a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
    - b. Approved equal: Hylar 5000®.
  2. Provide mill finish at locations not visible from outside building or public view.
- B. G-90 Bare Galvanized Steel: Conform to ASTM A525 General Requirements and to ASTM A526, Commercial Quality for hot-dip galvanizing (HDG) process. Zinc coating weight not less than 1-1/4 ounces per square foot nor more than 1-1/2 ounces per square foot of surfaces covered and conforming to ASTM A90, Table X1.1, measurement.
- C. Aluminum Sheet: Provide 3003-0 alloy for flashings. For all other sheet metal work furnish 3003-14 alloy.
  1. Factory finish with oven cured Kynar 500® based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's complete line.
    - a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
    - b. Approved equal: Hylar 5000®.
- D. Soft Temper Sheet Metal: Lead sheet, F.S. QQ-L-201, Grade B, 4 lb. per sq. ft.

- E. Gauge of Metal:
  - 1. Metal components of a roof assembly: 24 gauge (USS .025") minimum
  - 2. Scuppers, guttering, down spouts and splash pans (roof locations): 22 gauge (USS .0312") minimum. Gutter straps to be 18 gage.
  - 3. Through-Wall Flashing: 26 gauge minimum

## **2.02 GUTTER SYSTEM**

- A. Provide accessories for complete installation including end pieces, caps, elbows, outlet tubes, and basket type strainers. Conform to ANSI/SPRI GT-1 2016 (R2022) - Test Standard for External Gutter Systems per Arkansas Code (2021 IBC).
  - 1. Box Gutter: 6", Plain Box Style. Provide continuous removable Gutter Guard with sheet metal frame and stainless steel screen by LeafFilter® or approved equal.
  - 2. Downspout: 4" x 6" smooth rectangular aluminum with mitered elbows.
- B. Manufactured from Galvalume sheet steel in minimum 10 foot lengths, tapered and notched to provide a 1" telescoping lap joint. Seal watertight, and secure with 1/8" rivets, or join sections with flat locked soldered seams.
- C. Space gutter hangers and braces not more than 36" apart and secure with screws, bolts or approved clips. Brackets to be of compatible material to gutter, with matching finish and color.
- D. Slope gutter 1" in 20 feet to down spout to avoid ponding.
- E. Make leaders (downspouts) with 1-1/2" telescoped joints or full length without joints. Set leaders plumb, clear of walls. Secure with straps not over 6 feet apart and space so one is near top and another near bottom.
- F. Finish: Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard line.

## **2.03 GUTTER GUARD**

- A. Provide gutter guard system as supplied by LeafBlaster Pro®, 4031 Aspen Grove Dr, Ste 450, Franklin, TN 37067, (866) 483-8166 or approved equal. Provide 40-Year Warranty.
  - 1. Stainless Steel Micro-Mesh with Z-Bend Technology.
- B. Provide Rainwater Diverters, Fascia Mount Supports, Rails and other accessories as required for a complete installation. Install per manufacturer's published recommendations.
  - 1. Provide Gutter Guard Brush® and telescoping Extension Pole capable of extending up to 20'.

## **2.04 ACCESSORIES**

- A. Fasteners: All metal counter flashing and parapet cap flashing shall be attached with galvanized or cadmium plated screws with neoprene washers. Nails, screws and rivets used at other locations are to be the appropriate type for the purpose as described in the latest edition of the SMACNA Design Manual.
- B. Solder for Lead: ASTM B 32, 50% tin and 50% lead used with rosin flux.
- C. Roofing Cement: F.S. SS-C-153, Type I, Class A (summer grade) or Class B (winter grade) as applicable.
- D. Bitumastic Coating: F.S. TT-C-494, MIL-C-18480, or SSPC - Paint 12, cold applied solvent type bitumastic coating for application in dry film thickness of 15 mils per coat.

## **2.05 FABRICATION**

- A. Fabricate all metal flashing, counter-flashing, trim and related items to comply with profiles and sizes required. Fabricate to comply with the latest edition of the SMACNA "Architectural Sheet Metal Manual", metal manufacturer's recommendations, and recognized industry practices.
- B. For continuous running work, fabricate with expansion joints in flashing, spaced sufficiently close to prevent flashing damage and failure in resistance to water penetration. Form flashing to fit substrate in each application.
- C. Where sheet metal is required and no material or gauge is indicated on the Drawings, furnish and install highest quality and gauge commensurate with the referenced applicable standard, (SMACNA Manual, latest edition).

## **2.06 OTHER MATERIALS**

- A. Provide materials, not specifically described but required for complete and proper installation of flashing and sheet metal, of new materials, first quality of their respective kinds, and subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Inspection: Prior to work of this Section, carefully inspect installed work of other trades and verify work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with sheet metal installation in areas of discrepancy until discrepancies are resolved.



### 3.02 WORKMANSHIP

- A. General: Form sheet metal accurately to dimensions and shapes required, watertight and weather-tight, with angles and broken surfaces true, sharp, and in straight lines. Where intercepting other members, cope to an accurate fit and solder securely. Produce flat surfaces free from waves and buckles.
- B. Expansion: Allow a 3/8"-1/2" gap in coping caps between each section. Use 3-1/2" wide pre-finished 24 gage cover plate over joints.
  - 1. Set cover plates in visible bead of polyurethane sealant between the cap and cover plate. Wipe joints of excessive sealant.
  - 2. Attach cover plate at the front and back with hex head cadmium screws with neoprene washers, installed in the gap between the metal cap sections.
  - 3. Do not exceed maximum length of 10'-0" for cap, fascia and flashing sections. Furnish with factory formed slots or enlarged holes for fasteners.
- C. Paint metal in contact with mortar, concrete, and masonry materials with an alkali-resistant coating. Use heavy-bodied bituminous paint or approved equal.

### 3.03 THROUGH-WALL FLASHING

- A. General:
  - 1. Install continuous through-wall flashing.
  - 2. Where exposed portions are used as a counter-flashing, lap base flashing at least four inches and use thickness of metal as specified for exposed locations.
  - 3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing.
  - 4. Terminate exterior edge beyond face of wall approximately 1/4-inch with drip edge where not part of counter flashing.
  - 5. Turn back edge up 1/4-inch unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
  - 6. Terminate interior raised edge in masonry backup unit approximately 2 inches into unit unless shown otherwise.
  - 7. Under coping terminate both edges beyond face of wall approximately 1/4-inch with drip edge.
  - 8. Lap end joints not less than four inches. Seal laps with sealant.
  - 9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.
  - 10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
  - 11. Where ends of flashing terminate turn ends up 1 inch and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
  - 12. Turn flashing up not less than 8 inches between masonry wythes or behind exterior veneer.

**END OF SECTION 07 60 00**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Exposed Flexible trim/fascia units.
- B. Concealed Flexible flashing.
- C. Flexible roof/wall expansion joint systems.
- D. Mastic for setting and sealing joints.

**1.02 RELATED SECTIONS**

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 60 00 - Flashing and Sheet Metal.
- D. Section 07 92 00 - Joint Sealants.

**1.03 REFERENCES**

- A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
- B. ASTM D 1004 - Standard Test Methods for Initial Tear Resistance of Plastic Film and Sheeting.

**1.04 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- 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. Installation methods.
- C. Shop Drawings: Indicate material, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

## **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum five year manufacturing experience and capability for design, engineering and technical assistance for the selection, application, and installation of appropriate flashing systems for the project.
- B. Installer Qualifications: Experienced in the proper use and installation of flashing systems, including coordination with flashing of wall assembly components.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Stack flashing materials to avoid twisting, bending and abrasion. Protect materials from weather before installation.
- C. 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 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Nervastral Inc., which is located at: P. O. Box 11132 ; Greenwich, CT 06831; Toll Free Tel: 888-622-6030; Email: request info; Web: [www.nervastral.com](http://www.nervastral.com)
- B. Substitutions (shall be UV-Resistant):
  - 1. HydroFlash® UV + Flashing Tape by Benjamin Obdyke for open-joint cladding applications. Install per manufacturer's published recommendations - Typical.
  - 2. York 304 Self Adhering Stainless Steel Flexible Flashing.

3. Flex-Flash Flashing Self Adhering Flashing by Hohmann & Barnard, Inc.
  4. Weathermate™ Flexible Flashing by Dupont™
  5. Air-Shield™ Thru-Wall Flashing by W.R. Meadows.
  6. Blueskin® TWF Self-Adhered Thru-Wall Flashing Membrane by Henry®.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 33 00.
- D. Stainless Steel Drip Plate Flashing: DO NOT USE unless otherwise noted and approved by the design professional.
- E. Open Cavity Installation: All walls to receive thru-wall flashing should be capped to prevent moisture infiltration from entering the wall during construction.

## 2.02 MATERIALS

- A. Elastic Sheet Flashing Materials: Nervastral elastic sheet flashing membrane, non-reinforced flexible, black elastic sheet flashing complying with the following:
1. Tensile Strength: ASTM D 412, 2000 psi.
  2. Ultimate Elongation: ASTM D 412, 250 percent.
  3. Tear Resistance: ASTM D 1004, 350 lbs. per linear inch.
  4. Flexible over a 1/16 inch mandrel at minus 20 degrees F (minus 28.89 degrees C).
- B. Bituminous Membrane Flashing Materials: Nervastral Bitu-Rap sheet flashing membrane, cross linked polyethylene sheet laminated to a rubber-asphalt membrane, complying with the following:
1. Tensile Strength: ASTM D 412, 21 pounds per inch width.
  2. Ultimate Elongation: ASTM D 412, 350 percent.
  3. Tear Resistance: ASTM D 1004, 350 lbs. per linear inch.
  4. MVT: 0.2g/100 in 2nd/24 hr.
- C. Exposed Flashing:
1. Nervastral 600 Elastic Sheet Flashing: Recommended for exposed flashing in place of metal. 0.0625 inch gauge, width: 12 inches to 48 inches.
- D. Concealed Flashing:
1. Nervastral 56 Elastic Sheet Flashing: Concealed Flashing, 0.056 inch gauge (1.4 mm), width: 12 inches to 48 inches (305 mm to 1219 mm).
  2. Nervastral 300 Elastic Sheet Flashing: Concealed Flashing, 0.030 inch gauge (0.7 mm), width: 8 inches to 60 inches (203 mm to 1829 mm).
  3. Nervastral HD Elastic Sheet Flashing: Concealed Flashing, 0.020 inch gauge (0.5 mm), width: 8 inches to 60 inches (203 mm to 1829 mm).
  4. Nervastral HD-15 Elastic Sheet Flashing: Concealed Flashing. 0.015 inch gauge (0.4 mm), width: 12 inches to 60 inches (305 mm to 1829 mm).
  5. Nervastral Bitu-Rap Bituminous Membrane Flashing: 40 mils (1 mm) thick.

- E. Roof Expansion Joint Cover
  - 1. Nerva-Flex CA-454: Roof Expansion Joint Cove. 0.036 CPE, 3/8 inch (9.5 mm) foam, width: 13 inches (330 mm).
- F. Cold Setting Mastic: Nervastral Nervaplast Adhesive formulated for use with PVC flashing. Tacky, fast-grabbing semi-pressure-sensitive rubber or resin base adhesive suitable for bonding PVC sheet to itself and to a wide variety of building materials.
- G. Roofing Cement: Cut-back asphalt containing long fibered material, in trowel grade consistency.

### **2.03 FABRICATION**

- A. Forming: Fabricate flashings true to shape and accurate in dimension. Form pieces in longest possible lengths to minimize joints. Fold flashing at corners and at ends of pans instead of cutting.
- B. Joints: Provide not less than 4 inches (100 mm) of overlap at flashing joints.

## **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 roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

### **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.
- C. Surfaces to receive flashing shall be reasonably smooth, free from holes or other irregularities and dry to ensure proper bonding to substrate. Metal surfaces shall be free of scale, oil, grease and dust to assure a proper bond.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide flexible flashing in the locations indicated on the Drawings.

- C. Provide Flexible flashings for concealed flashings at the following locations:
  - 1. Around windows and doors.
  - 2. Water protection on sills and heads of openings.
  - 3. Spandrel beams.
  - 4. Parapets.
  - 5. Brick masonry through wall flashings and at cavity walls.
  
- D. Provide Flexible flashings for exposed flashings at the following locations:
  - 1. Roof parapets
  - 2. Roof equipment curbs.
  - 3. Skylights.
  - 4. Vent pipes.
  - 5. Perimeter curbs.
  - 6. Expansion joints.
  
- E. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
  - 1. Carry flashing through wall and leave exposed for inspection.
  - 2. After inspection, cut flashing flush with surface of masonry.
  - 3. Remove mortar or other obstructions from weep holes at flashing locations.
  
- F. Flashing in Frame Construction: Install over solid backing, both vertically and horizontally. Secure in place with mastic; avoid puncturing installed flashing with nails or other fasteners.
  
- G. Miscellaneous Flashing: Lay flashing in full trowel coat of mastic, lapping joints not less than 6 inches (150 mm). Roll surface of flashing with rubber hand roller to remove all air.
  
- H. Use Nervastral Nervaplast Cold Setting Mastic with all flashing. Roofing cement may be used only at non-critical locations.

### **3.04 PROTECTION**

- A. Protect installed products until completion of project.
  
- B. Touch-up, repair or replace damaged Work before proceeding with construction on concealing work.

**END OF SECTION 07 65 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. Extent of coping system is shown on the drawings and indicated by provisions of this section.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, materials, components, fasteners, finish, and accessories.
- D. Samples: Submit manufacturer's sample of coping system.
  - 1. Sample Size: Minimum 6 inches long.
- E. Color Samples: Submit manufacturer's color samples of coping cap, consisting of complete set of metal color chips representing manufacturer's full range of available colors.
- F. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- G. Manufacturer's Project References: Submit manufacturer's list of 10 successfully completed coping system projects of similar size and scope to this Project, including project name and location, name of architect, and type and quantity of coping systems furnished.
- H. Warranty Documentation: Submit manufacturer's standard warranty.

#### **1.04 REFERENCE STANDARDS**

- A. Factory Mutual (FM Global) ([www.fmglobal.com](http://www.fmglobal.com)).
- B. Single Ply Roofing Industry (SPRI) ([www.spri.org](http://www.spri.org)):
  - 1. ANSI/SPRI/FM 4435/ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

#### **1.05 PRE-INSTALLATION MEETINGS**

- A. Convene pre-installation meeting 1 week before start of installation of coping system.
- B. Require attendance of parties directly affecting Work of this Section, including Contractor, Architect, installer, and manufacturer's representative.
- C. Review the Following:
  - 1. Materials.
  - 2. Examination of roof edge areas.
  - 3. Installation.
  - 4. Cleaning.
  - 5. Protection.
  - 6. Coordination with other Work, including membrane roofing installation.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Manufacturer regularly engaged in the manufacturing of coping systems of similar type to that specified for a minimum of 5 years.
- B. Installer's Qualifications:
  - 1. Installer regularly engaged in installation of coping systems of similar type to that specified for a minimum of 5 years.
  - 2. Use persons trained for installation of coping systems.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials in accordance with manufacturer's instructions.
  - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
  - 3. Store materials in clean, dry area indoors.
  - 4. Do not store materials directly on floor or ground.
  - 5. Protect materials and finish during storage, handling, and installation to prevent damage.

## 1.08 WARRANTY

### A. Warranty Period:

1. "Formed Coping" Coping System: Coping system shall not blow off, leak, or cause membrane roofing failure for 20 years in wind speeds up to 110 mph, when installed in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturer: Hickman Edge Systems, 4 Commerce Way, Arden, North Carolina 28704. Toll Free 800-892-9173. Phone 828-676-1700. [www.Hickmanedgesystems.com](http://www.Hickmanedgesystems.com)
- B. Substitutions: Comply with Division 01.
- C. Single Source: Provide materials from single manufacturer.

### 2.02 COPING SYSTEM

- A. Coping System: "Formed Coping".
  1. Description:
    - a. Formed coping with continuous front cleat for capping parapet walls.
    - b. Watertight.
    - c. Maintenance free.
  2. Tested: ANSI/SPRI/FM 4435/ES-1.
  3. Approved: FM 1-180 rating.
  4. Performance Characteristics:
    - a. Formed Coping Cap Sections:
      - 1) Capable of expanding and contracting freely, while mechanically locked in place with exposed fasteners at back leg of coping cap.
      - 2) Lock to clips by mechanical pressure from concealed splices.
    - b. Formed Coping Cap Joints: Underlaid with concealed splices.
  5. Wall Width: Indicated on the Drawings.
    - a. Minimum: 4 inches.
    - b. Maximum: 24 inches.
- B. Coping Cap:
  1. Material: 0.050-inch aluminum.
  2. Formed Lengths: 10'-0".
  3. Finish: Pre-finished Kynar.
  4. Color: As selected by architect.
  5. Face Dimension: Indicated on the Drawings.
    - a. Minimum: 3 inches.
    - b. Maximum: 12 inches.

6. Back Dimension: Indicated on the Drawings.
  - a. Minimum: 2 inches.
  - b. Maximum: 8 inches.
  
- C. Continuous Front Cleat:
  1. Material: 20-gauge galvanized steel.
  2. Length: 120 inches.
  3. Fastener Holes: Slotted.
  
- D. Concealed Splices:
  1. Material: Same as coping cap.
  2. Finish and Color: Same as coping cap.
  3. Width: 6 inches.
  4. Non-hardening sealant.
  
- E. Fasteners:
  1. 1-1/2-inch stainless steel ring-shank nails through front cleat.
  2. #9 x 1-1/2-inch stainless steel screws with washer at back leg of coping cap.
  3. Suitable for intended substrate.
  4. Provided by coping system manufacturer.
  
- F. Factory-Fabricated Accessories:
  1. Miters.
  2. End caps.
  3. End terms.
  4. Material, Finish, and Color: Same as coping cap.
  5. Fabrication: Welded.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine roof edge areas, including membrane roofing and blocking, to receive coping system.
  
- B. Verify surfaces to support coping system are clean, dry, flat, level from front to back, secure, and of proper dimensions.
  
- C. Notify Architect of conditions that would adversely affect installation.
  
- D. Do not begin installation until unacceptable conditions are corrected.

#### **3.02 INSTALLATION**

- A. Install coping system in accordance with manufacturer's instructions at locations indicated on the Drawings.

- B. Membrane Roofing: Specified in Section 07 54 23.
- C. Shim areas of walls not level from front to back.
- D. Fasteners: Install coping system using fasteners in accordance with manufacturer's instructions.
- E. Install concealed splices at cap joint locations.
- F. Thermal Movement: Leave 1/4-inch gap between coping cap sections to allow for thermal expansion and contraction.
- G. Apply non-hardening sealant at splices.
- H. Review lengths of straight pieces of coping cap before cutting to avoid creating relatively short sections adjacent to full-length sections.
- I. Isolate coping system from ACQ treated wood blocking or other galvanically incompatible material with appropriate membrane material.

### **3.03 CLEANING**

- A. Clean coping system promptly after installation in accordance with manufacturer's instructions.
- B. Remove clear protective vinyl film.
- C. Do not use harsh cleaning materials or methods that could damage finish.

### **3.04 PROTECTION**

- A. Protect installed coping system to ensure that, except for normal weathering, coping system will be without damage or deterioration at time of Substantial Completion.

**END OF SECTION 07 71 13**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install roof accessories specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Sample: For type of ridge vent specified; 12” long sample.
1. Size and location of ridge vents specified in this Section.
  2. Method of attaching ridge vent to roof structure.
  3. Other roof mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

**1.04 WARRANTY**

- A. Manufacturer’s standard limited lifetime warranty against defects in manufacturer’s materials and workmanship.

**PART 2 - PRODUCTS**

**2.01 ROOF SCUTTLE AND CURB**

- A. Provide Bilco Co. Type "F-50TB", 48" x 48", Thermally Broken, factory assembled unit with standard 12" high x 3" thick insulated curb (Basis-of-Design). Approved equal manufacturers:
1. Nystrom Building Products, Inc., 800-547-2635, [www.nystrom.com](http://www.nystrom.com).
  2. Babcock Davis, 888-412-3726, [www.babcockdavis.com](http://www.babcockdavis.com).
- B. Hatch Rail System:
1. Furnish and install hatch rail system Model RL-F. The hatch rail system shall be field assembled and installed per the manufacturer’s instructions.

2. Performance characteristics:
  - a. High visibility safety yellow color shall be molded in.
  - b. Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing material.
  - c. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.
  - d. UV and corrosion resistant construction with a twenty-five year warranty.
  - e. Self-closing gate shall be provided with hatch rail system.
3. Posts and Rails: Shall be round pultruded reinforced fire retardant yellow fiberglass treated with a UV inhibitor.
4. Hardware: Mounting brackets shall be ¼” thick hot dip galvanized steel. Hinges and post guides shall be 6063T5 aluminum. Fasteners shall be Type 316 stainless steel.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION OF ROOF ACCESSORIES**

- A. Install roof accessories complying with manufacturer's installation specifications, accepted shop drawings, and with projection through roof watertight and weathertight.
- B. Separate roof accessories metal surfaces from dissimilar metals and from wood substrates, using thick coating of bituminous compound or separation recommended by metal manufacturer to prevent corrosive action.

**END OF SECTION 07 72 00**



**PART 1 – GENERAL**

**1.01 SECTION INCLUDES**

- A. This section includes Exterior Fin Wall System as shown on the Architectural Drawings.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings shall show location of Exterior Fin Wall System as well as specified finish, tolerance, and Fin profile size.
- D. PE Stamped Calculations: PE stamped calculations from Manufacturer for wind loads will be included as a part of the package.
- E. Samples: Submit three (3) samples consisting of Fin profile/shape.
- F. Certification: Submit certification from Manufacturer of Exterior Fin Wall System that products comply with specified requirements including finish as specified.
- G. Qualification Data:
  - 1. Firms specified in "Quality Assurance" Article must demonstrate their capabilities and experience by including lists of completed projects with project names and addresses, names and addresses of Architects and owners, and other information specified.
- H. Warranty:
  - 1. Provide sample of product warranty.
- I. Cleaning and Maintenance Instructions

#### **1.04 REFERENCES**

- A. GENERAL
  - 1. Comply with applicable requirements of the following, except where more stringent requirements are indicated by building codes.
- B. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 2605 - Specification for Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels
- C. ASTM (American Society for Testing and Materials):
  - 1. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
  - 2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. Aluminum Standards and Data provided by The Aluminum Association, Inc.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer: Furnish components from one (1) Manufacturer with a minimum of ten (10) years of experience in the fabrication of architectural metal specialties, utilizing systems, materials, and techniques as herein specified.
- B. Installer: Firm with not less than three (3) years of successful experience in the installation of systems similar to those required by this project and acceptable to Manufacturer of the system.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. All materials shall be protected during fabrication, shipment, site storage, and erection to prevent damage from other trades. Store Exterior Fin Wall System and components inside a well-ventilated area, away from uncured concrete and masonry, and protected from the weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

#### **1.07 DESIGN / PERFORMANCE REQUIREMENTS**

- A. All components of the Exterior Fin Wall System shall be provided by one (1) Manufacturer to ensure single source responsibility and quality control.
- B. Project Specific PE Calculations to be provided by Manufacturer to show that the Exterior Fin Wall System product meets Design Loads.

## **1.08 WARRANTY**

- A. Furnish Manufacturer's:
  - 1. Warranty that materials furnished will perform as specified for a period of not less than one (1) year from date of material shipment when installed in accordance with Manufacturer's recommendations. Extended warranty is available upon request.

## **PART 2 – PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis-of-Design: Exterior Fin Wall System shall be manufactured by Gordon, Inc. For all inquiries contact: Gordon, Inc., 5023 Hazel Jones Road, Bossier City, LA 71111  
Tel.: (800) 747-8954
- B. The products specified herein are standard manufactured products of the listed Manufacturer.
- C. System must be manufactured in the U.S.A.

### **2.02 PRODUCT CONSTRUCTION**

- A. Materials:
  - 1. 2" x 12" Extruded Aluminum Tube Fins in Alloy and Thickness required to meet Design Loads.
  - 2. Structural Aluminum Angles to connect Tube Fins to structure.
  - 3. Fasteners to connect Structural Angles to Tube Fins provided by Gordon.  
Anchors to connect Structural Angles to structure by Installing Contractor.

### **2.03 FINISHES**

- A. All Tube Fins and Structural Angles shall receive 5-stage pretreatment with dried-in-place conversion coating prior to receiving an electrostatically applied AAMA 2605 compliant powder coating finish, depending on final application.
  - 1. Color to be Custom RAL Color as selected by the architect.

### **2.04 FABRICATION**

- A. Provide factory fabricated Supports, Tube Fins, and Connectors in lengths noted on Manufacturer's approved submittal drawings.
- B. Tube Fins to be Powder Coated to match approved color.
- C. Factory Attached End Caps provided, as required.

## **PART 3 – EXECUTION**

### **3.01 EXAMINATION**

- A. Examination of Surfaces: Installer must examine conditions under which work is to be performed and must notify Contractor in writing of unsatisfactory conditions.
- B. Verify that field measurements and block-out dimensions are as shown on Shop Drawings.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the Manufacturer to achieving the best result for the project conditions.

### **3.03 INSTALLATION**

- A. General: Comply with Manufacturer's printed instructions and any special instructions provided.
- B. All structural supports and fasteners to structure to be provided by the installing contractor.

### **3.04 CLEANING**

- A. Follow Manufacturer's cleaning instructions for specified finish.

### **3.05 PROTECTION**

- A. Procedures: Protection of Exterior Fin Wall System from damage by other trades after installation to be provided by General Contractor.
- B. Damage to Finished Work: Finished units shall be without damage. Damage shall be repaired by the Contractor at the expense of the party damaging the material, as in accordance with the contract requirements.

**END OF SECTION 07 77 00**

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**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section includes firestopping and/or soundproofing for through-penetrations and joints in or between the following fire-resistance rated assemblies, including both blank openings, linear openings, and openings containing penetrating items:
- B. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
  - 1. Roof-ceiling assemblies.
  - 2. Walls and partitions.
  - 3. Smoke barriers.
  - 4. Construction enclosing compartmentalized areas.
- C. This Section describes the requirements for furnishing and installing firestopping for fire-rated construction. Contractor is responsible for identifying various conditions requiring firestopping material and for submitting proposed UL Tested Assemblies for Architects review.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
  - 1. Material Safety Data Sheets: Submit MSDS for each firestop products.
  - 2. Shop Drawings: Show typical installation details for methods of installation. Indicate which firestop materials will be used where and thickness for different hourly ratings.
  - 3. Installer Documentation: Submit document from Firestop Manufacturer wherein Manufacturer recognizes, i.e. approves installer for said Manufacturer's Firestop products.
  - 4. Prepare job mock-up of the material proposed for use in the project as directed by Architect. Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining work, including aesthetics. It is recommended that the Authority Having Jurisdiction (AHJ) or Fire Marshal review and comment on the job mock-up and contractor is to notify architect of AHJ observations.

- B. Substitutions will not be considered prior to the award of the General Contract.

#### **1.04 QUALITY ASSURANCE**

- A. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
- B. Firestopping material shall be asbestos free and free of any PCBs.
- C. Do not use any product containing solvents or that requires hazardous waste disposal.
- D. Do not use Firestop Products which after curing, dissolve in water.
- E. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.
- F. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

#### **1.05 PRODUCT DELIVERY, STORAGE AND HANDING**

- A. Deliver material in the manufacturers' original, unopened containers or packages with manufacturer's name, product identification, lot numbers, UL-labels, and mixing and installation instructions, as applicable.
- B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturers.
- C. All Firestop materials shall be installed prior to expiration of shelf life.

#### **1.06 PROJECT CONDITIONS**

- A. Conform to Manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.

## **1.07 WARRANTY**

- A. Firestop Contractor shall warranty that firestopping systems used meet firestopping requirements as herein specified.

## **1.08 SEQUENCING**

- A. Coordinate this work as required with work of other trades.
- B. Firestopping shall precede gypsum board finishing.

## **1.09 PROTECTION**

- A. Where firestopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide materials from one of the following manufacturers:
  - 1. 3M
  - 2. Cafco
  - 3. Hilti
  - 4. STI Firestop
  - 5. Approved Equal.

### **2.02 MATERIALS**

- A. Provide mortars, sealants, caulks, putty, collars, pillows, wrap strips, composite sheets and related materials as required by the UL Design Assembly proposed for each individual application.
- B. Accessories:
  - 1. Forming/Damming Materials: Mineral fiberboard or other type recommended by manufacturer.
  - 2. Primer, Sealant and Solvent Cleaner: As recommended by manufacturer.
- C. Seal all penetration of sound isolating construction with non-hardening material.
- D. At sound isolating construction with multiple penetrations in a relatively small area, provide Nelson Class 200 multi-cable transit system as manufactured by Nelson Firestop Products, 1-800-331-7325, or approved equal.

## **2.03 SAFING INSULATION**

- A. Provide semi-rigid product designed for use as a fire stop that is non-combustible and non-corrosive to steel as manufactured by Thermafiber Div. of USG Interiors; Cafco Industries Ltd.; Roxul, or approved equal product combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C665, Type I; minimum density of 4.0 pcf; passing ASTM E136 for combustion characteristics and with Fire Hazard Classification when tested according to ASTM E84; flame spread of 15 or less, fuel contribution of 0 and smoke development of 0.
- B. Curtain Wall Assembly, Spandrel Panels, and Perimeter Joint Protection: Provide Intertek Design No. CEJ 322 P or propose alternate system meeting design conditions, to include the following:
  - 1. Reinforcing angle at horizontal butt joints
  - 2. Perimeter Fire Barrier Reinforcement Angle
  - 3. Curtain Wall Insulation, 2" thick (aluminum foil scrim on interior side of room)
  - 4. Impaling Screws
  - 5. Elastomeric Firestop Spray
  - 6. Other components required for a complete system

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine the areas and conditions where Firestops are to be installed and notify the architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the architect.
- B. Verify that environmental conditions are safe and suitable for installation of Firestop product(s).

### **3.02 CONDITIONS REQUIRING FIRESTOPPING**

- A. General:
  - 1. Provide firestopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing, or otherwise.
  - 2. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.



B. Building Exterior Perimeters:

1. Where exterior facing construction is continuous past a structural floor, and a space would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly. Mineral wool by itself is not an acceptable firestop, neither is mineral wool used with beads of caulking applied along length of mineral wool/curtain wall or mineral wool/floor slab junctures. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL listed Firestop Sealant.
2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.
3. Where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam, or strut, and the finish on the interior wall face does not continue up too close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the lower edge of the structural member, provide firestopping to continuously fill such open space.

C. Interior Walls and Partitions:

1. Where a wall or partition is continuous past a structural floor, such as at stairwells and vertical shafts, and a space would otherwise remain open between the wall face and perimeter edge of the adjoining structural floor, provide firestopping.
2. Provide firestopping whether or not there are any clips, angles, plates, or other members bridging or interconnecting the wall and floor systems, and whether or not such items are continuous.
3. Where the top edge of a fire-rated wall or partition abuts and is at right angle to fluted-type metal decking, and the construction is such that would otherwise leave the flute spaces open, provide firestopping.
4. Where the bottom track or plate of a partition meets the concrete slab provide firestopping sealant.
5. Where the bottom track or plate of a partition meets the top of the concrete block wall below the drywall partition provide firestopping sealant.

D. Penetrations:

1. Penetrations include conduit, cable, wire, pipe, duct, electrical boxes, fire extinguisher cabinets, toilet accessories or other elements which pass through or penetrate one or both sides of a fire rated floor, wall, or partition.
  - a. If "5 sided" gypsum board enclosures are omitted where metal electrical back boxes not exceeding 16 square inches occur at one side only of a wall within a single stud cavity; provide fire stopping material described in this Section to completely encompass the back box and its annular space.
2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. Where penetrations occur at fire-rated walls or partitions of solid-type construction, provide firestopping to completely fill spaces around the penetration, in accordance with ASTM E 814.
  4. Where penetrations occur at fire-rated walls or partitions of hollow-type construction, provide firestopping to completely fill spaces around the penetration, on each side of the wall or partition, in accordance with ASTM E 814.
  5. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space - if any - between sleeve and wall of opening.
- E. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction in a manner essentially the same as specified above.

### **3.03 INSTALLATION**

- A. General:
1. Installation of Firestops shall be performed by applicator/installers qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
  2. Apply Firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
  3. Coordinates with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire related construction have been permanently installed prior to installation of Firestops, schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of Firestops.
  4. At gypsum board fire walls the entire gap between the floor slab up to the bottom edge of the gypsum board is to be filled 100% and continuous.
- B. Dam Construction: Install dams when required to properly contain Firestopping materials within openings and as required to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming materials may be left as a permanent component of the Firestop system.
- C. Field Quality Control:
1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
  2. Follow safety procedures recommended in the Material Safety Data Sheets.
  3. Finish surfaces of firestopping which is to remain exposed in the completed work to a uniform and level condition.
  4. All areas of work must be accessible until inspection by the applicable Code authorities.
  5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

### **3.04 CLEANING**

- A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.
- B. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

**END OF SECTION 07 84 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish labor, materials, tools, and equipment required to completely close (with caulking compound or sealant) all joints to give a finished appearance. Items to be caulked or sealed include but are not limited to the following:
1. Hollow metal frames.
  2. Exterior doors, louvers, windows and any other openings in exterior walls.
  3. Interior fixed glass.
  4. Penetrations by piping, conduit and similar items.
  5. Plumbing fixtures.
  6. Millwork.
  7. Flooring, including saw-cut concrete slab-on-grade.
  8. Paving and sidewalk joints.
  9. Dissimilar finishes.
  10. Joints shown on drawings or specified to be caulked or sealed.
  11. All joints or gaps between similar or dissimilar materials that do not receive closure trim are to be caulked/sealed with the appropriate material as listed in Part 2 of this Section.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Installer qualifications.
- D. Contractor certification.
- E. Manufacturer's installation instructions for each product used.
- F. Cured samples of exposed sealants for each color.
- G. Manufacturer's Literature and Data:
1. Primers

2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- H. Manufacturer warranty.

#### **1.04 REFERENCES**

- A. ASTM E84 (UL 723): Surface Burning Characteristics
- B. ASTM E814 (UL 1479) and ULC-S115: Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- C. ASTM E1966 (UL 2079): Standard Test Method for Fire-Resistive Joint Systems
- D. ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

#### **1.05 QUALITY ASSURANCE**

- A. Qualifications of Applicators: Use workmen thoroughly skilled and specially trained in techniques of caulking, and completely familiar with manufacturer's published recommendations for caulking material used.
- B. Rejection of Installed Caulking: Lack of skill by caulking installers is sufficient ground for Architect to reject installed caulking and to require its removal and complete recaulking at Contractor's expense.
- C. Guarantee: Guarantee caulking materials and workmanship, in writing for 2 years after substantial completion date. Repair at Contractors expense any defects developing within guarantee period.
- D. Submit manufacturer's product data sheets and color selection information for every brand and type of sealant, caulk and accessory item proposed for use on this project.
- E. Refer to Underwriters Laboratories, Inc. (UL) Volume 2 with Hourly Ratings for Joint Systems, Through-Penetration Firestop Systems and Electrical Circuit Protective Systems and Duct Assemblies.

#### **1.06 PRODUCT HANDLING**

- A. Protection: Protect caulking materials before, during, and after installation. Protect installed work and materials of other trades. In event of damage, immediately make repairs and replacements necessary at Contractor's expense.
- B. Storage: Store caulking materials and equipment under conditions recommended by manufacturer. Do not use materials stored for period of time exceeding maximum recommended material shelf-life.

## **1.07 JOB CONDITIONS**

- A. Inspection: Carefully inspect installed work of trades and verify work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.
- C. Do not install sealants under adverse weather conditions, or when temperatures are not within manufacturer's recommended limitations for installation. Install sealants only when forecasted weather conditions are favorable for proper care and development of high early bond strength.

## **1.08 MOCK-UP**

- 1. Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS FOR CAULKING AND SEALING**

- A. Select caulking materials for specific locations complying with manufacturer's recommendations. Provide caulking, sealant and accessory items in color(s) selected to match adjacent materials or as selected by Architect from manufacturer's complete line.
- B. Silicone Sealant: Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 25.
  - 1. Silicone Sealant 790/791/795 by Dow-Corning Corp.
  - 2. Spectrum 1 by Tremco
  - 3. 890 FTS/864 NST by Pecora Corporation
  - 4. Approved Equal
- C. Mildew-Resistant Silicone Sealant: Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 25.
  - 1. Silicone Sealant 786 by Dow-Corning Corp.
  - 2. Sanitary 1700 by GE.
  - 3. Approved equal.
- D. Acrylic Latex Caulk (interior only): General purpose, gun grade, non-sag, paintable, non-staining latex sealant complying with ASTM C834.
  - 1. AC-20 + Silicone by Pecora.
  - 2. Acrylic Latex by Tremco.
  - 3. Approved equal.

- E. Acoustical Sealant: General purpose, gun grade, non-sag, paintable, non-staining latex sealant complying with ASTM C834.
  - 1. SHEETROCK® Brand Acoustical Sealant by U.S. Gypsum
  - 2. AC-20® FTR Acoustical and Insulation Sealant by Pecora Corporation
  - 3. STOPGAP by Auralex Acoustics
  - 4. Sashco Big Stretch Caulk
  - 5. Green Glue Noiseproofing Sealant
  - 3. Approved equal.
  
- F. Polyurethane Sealant (for vertical surfaces): Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 35.
  - 1. MasterSeal® NP 1™ (formerly Sonolastic® NP 1™).
  - 2. Vulkem 921 by Mameco.
  - 3. Dynatrol I by Pecora.
  - 4. Dymonic by Tremco.
  - 5. QSC-102 by Carlisle.
  - 6. Approved equal.
  
- G. Polyurethane Sealant (for horizontal surfaces): Single component, non-priming, self-leveling, pourable grade product meeting ASTM C920, Type S, Grade P, Class 25.
  - 1. MasterSeal® SL 1™ (formerly Sonolastic® SL 1™).
  - 2. Vulkem 45 by Mameco.
  - 3. NR-201 by Pecora.
  - 4. THC-901 by Tremco.
  - 5. QSC-131 by Carlisle.
  - 6. Approved equal.
  
- H. Two component epoxy system (laboratory sink components) to withstand prolonged immersion in gasoline, gasohol, fuels, oils, alcohols, methyl, ethyl, butyl, ethyl acetates, toluene, as well as a wide number of other organic and inorganic solvents. Excellent mechanical properties including high tensile and compressive strengths.
  - 1. MasterBond®, Inc. EP21ARHT; Tel.: (201) 343-8983
  - 2. Viton® Fluoroelastomer Chemical-Resistant Sealant as provided by Master-Carr
  - 3. Approved equal

## **2.02 SEALANT BACKER RODS**

- A. Sealant Backer Rod for general use except at floor and deck joints: Tremco Open Cell Polyurethane, or approved equal, open cell type as recommended by sealant manufacturer for compatibility with sealant.
  
- B. Sealant Backer Rod for use at horizontal floor and deck joints: MasterSeal® 920 by BASF, or approve equal closed cell type as recommended by sealant manufacturer for compatibility with sealant. MasterSeal® 921 by BASF may be used where appropriate.
  
- C. Provide rod sized and shaped to control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide



a highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.

### **2.03 MISCELLANEOUS MATERIALS**

- A. Joint Cleaner Compound: Use type recommended by sealant and caulking compound manufacturer for joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Use type recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Use self adhesive polyethylene tape or plastic tape recommended by sealant manufacturer. Apply to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant.
- D. Joint Filler: W.R. Meadows, Sealtight Standard Cork, Expansion Joint Filler produced from clean, selected, granulated cork bonded with a phenolic resin, or approved equal meeting ASTM D 1752, Type II.

### **2.04 GENERAL APPLICATION GUIDE**

- A. Interior caulking, except joints with ceramic tile, metal, glass and aluminum: Acrylic Latex Caulk.
- B. Sound rated walls, partitions and ceilings: Acoustical Sealant.
- C. Interior and Exterior joints with metal, glass and aluminum: Silicone sealant.
- D. Joints with ceramic tile and plumbing fixtures: Mildew resistant Silicone sealant.
- E. Horizontal and Vertical building joints: Polyurethane sealant.
- F. Paving Joints: Refer to Division 32
- G. Horizontal and Vertical building joints: Parking Structure Silicone

## **PART 3 - EXECUTION**

### **3.01 CHOICE OF CAULKING MATERIAL**

- A. Use sealant and caulking materials best suited to the installation and recommended by caulking material manufacturer.

### 3.02 INSPECTION

- A. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed. Do not proceed with joint sealer work until unsatisfactory conditions are corrected.

### 3.03 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of gaskets, sealants and caulking compounds. Remove dirt, insecure coatings, moisture and substrates which could interfere with gasket seal and bond of sealant or caulking compound. Etch concrete and masonry joint surfaces when recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where required, and when recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond. Do not allow spillage and migration onto adjoining surfaces.

### 3.04 INSTALLATION

- A. Comply with manufacturer's printed instructions except when more stringent requirements are specified, and except when manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth and position in joint as required to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod except when required to be omitted or recommended to be omitted by sealant manufacturer for application required.
- D. Install bond breaker tape when required by manufacturer's recommendations to ensure liquid-applied sealants will perform as intended.
- E. Employ proven installation techniques, which ensure sealants are deposited in uniform, continuous ribbon without gaps or air pockets, and with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise required, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints occur between a horizontal surface and vertical surface, fill joint to form a slight cove, so joint will not trap moisture and dirt.
- F. Install liquid-applied sealant to depths required and as recommended by sealant manufacturer.
- G. Spillage: Do not allow sealants and compounds to overflow from joint confines or to spill onto adjoining work, or to migrate into voids of exposed finished. Clean adjoining surfaces to eliminate evidence of spillage without damaging adjoining surfaces.

- H. Recess edges of exposed joint fillers slightly behind adjoining surfaces, unless otherwise required, so compressed units will not protrude from joints.
- I. Acoustical Sealant Application: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
  - 1. Where sound rated walls and partitions are penetrated by pipe, conduit, duct, etc.; pack annular space with acoustical fiberglass insulation until flush with both faces of wall. Seal both sides and the entire annular space between the penetrating item and the wall board with acoustical sealant. Also, seal at top and bottom edges of acoustical walls and partitions where wall board abuts a horizontal surface. Joint is to be full and continuous from slab to gypsum board edge at bottom of gypsum board walls.
  - 2. Do not allow any rigid material or connection to bridge the separation between the acoustical construction and the penetrating item. Upon inspection, if bridging is found to exist, all sealed penetrations may be ordered removed and resealed at Contractor's expense.
- J. At joints in face brick and precast concrete, apply sand and ground up mortar to uncured sealant to match appearance of mortar joints.

### **3.05 CURE AND PROTECTION**

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Cure and protect sealants in manner which will minimize increases in modulus of elasticity and accelerated aging effects.

**END OF SECTION 07 92 00**

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**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Section includes interior expansion joint cover assemblies.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: For each expansion joint cover assembly.
1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
  2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- D. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches (150 mm) long in size.
- E. Samples for Initial Selection: For each type of exposed finish.
1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- F. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.
- G. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
1. Manufacturer and model number for each expansion joint cover assembly.
  2. Expansion joint cover assembly location cross-referenced to Drawings.
  3. Nominal, minimum, and maximum joint width.
  4. Movement direction.
  5. Materials, colors, and finishes.

6. Product options.
7. Fire-resistance ratings.

#### **1.04 QUALITY ASSURANCE**

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
  1. Build mockup of typical expansion joint cover assembly as indicated on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.01 ASSEMBLY DESCRIPTION**

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 5 percent.
- B. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of the following:
  1. Earthquake motions determined in accordance with ASCE/SEI 7.
  2. Thermal motions determined in accordance with ASCE/SEI 7.
  3. Wind sway motions determined in accordance with ASCE/SEI 7.
- C. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance in accordance with UL 2079 by a qualified testing agency.
  1. Hose Stream Test: Wall-to-wall and wall-to-soffit assemblies shall be subjected to hose stream testing.
- D. Expansion Joint Design Criteria; refer to Structural drawings:
  1. Type of Movement: Thermal.
    - a. Nominal Joint Width: As indicated on Drawings.
    - b. Minimum Joint Width: As indicated on Drawings.

- c. Maximum Joint Width: As indicated on Drawings.
- 2. Type of Movement: Seismic.
  - a. Joint Movement: As indicated on Drawings.
- 3. Slip and Tripping Hazard Performance: Comply with United States Access Board's ADA-ABA Accessibility Guidelines, Section 4.5, Paragraphs 4.5.1 and 4.5.2 for edge height and slopes.

### **2.03 WALL EXPANSION JOINT COVERS**

- A. Metal-Plate Wall Joint Cover 9500 Series: Metal cover plate fixed on one side of joint gap and free to slide on other.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; WD Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  - 2. Application: Wall to wall (95GW-3) and wall to corner (95GWC-3).
  - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
  - 4. Exposed Metal:
    - a. Aluminum: Clear anodic, Class I.
      - 1) Color: As selected by Architect from full range of industry colors and color densities.

### **2.06 MATERIALS**

- A. Aluminum: ASTM B221 (ASTM B221M), Alloy 6063-T5 for extrusions; ASTM B209 (ASTM B209M), Alloy 6061-T6 for sheet and plate.
  - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 for plates, sheet, and strips.
- C. Brass: ASTM B36/B36M, UNS Alloy C26000 for half hard sheet and coil.
- D. Bronze: ASTM B455, Alloy C38500 for extrusions; Alloy C23000 red brass for plates.
- E. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- F. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.
- G. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

- H. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## **2.07 ALUMINUM FINISHES**

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## **2.08 ACCESSORIES**

- A. Fire Barrier Mats; refer to the drawings: 2-hour fire-rated intumescent fire barrier mat including expansion joint system where required.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; MetaMat MW Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  - 2. Application: Vertical.
  - 3. Fire-Resistance Rating: Not less than 2 hours.
- B. Fire Block; refer to the drawings: 1- to 2-hour fire-rated intumescent fire barrier including expansion joint system with shear movement capability.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; MetaBlock MB Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  - 2. Application: Vertical.
  - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
- C. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
  - 1. Provide where indicated on Drawings.
- D. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, setscrews, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.



- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Prepare substrates in accordance with expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

### **3.03 INSTALLATION**

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
  - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
  - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  - 4. Install frames in continuous contact with adjacent surfaces.
    - a. Shimming is not permitted.
  - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.
  - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
  - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

- F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
  - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

### **3.04 PROTECTION**

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by the work of other Sections.

**END OF SECTION 07 95 13.13**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Section includes exterior building expansion joint cover assemblies.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: For each expansion joint cover assembly.
  - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
  - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- D. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches (150 mm) long in size.
- E. Samples for Initial Selection: For each type of exposed finish.
  - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- F. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.
- G. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
  - 1. Manufacturer and model number for each expansion joint cover assembly.
  - 2. Expansion joint cover assembly location cross-referenced to Drawings.
  - 3. Nominal, minimum, and maximum joint width.
  - 4. Movement direction.
  - 5. Materials, colors, and finishes.

6. Product options.
7. Fire-resistance ratings.

#### **1.04 QUALITY ASSURANCE**

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
  1. Build mockup of typical expansion joint cover assembly as indicated on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.01 ASSEMBLY DESCRIPTION**

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 5 percent.
- B. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of the following:
  1. Earthquake motions determined in accordance with ASCE/SEI 7.
  2. Thermal motions determined in accordance with ASCE/SEI 7.
  3. Wind sway motions determined in accordance with ASCE/SEI 7.
- C. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance in accordance with UL 2079 or ASTM E1966 by a qualified testing agency.
- D. Expansion Joint Design Criteria; refer to structural drawings:
  1. Type of Movement: Wind sway.
    - a. Nominal Joint Width: As indicated on Drawings.
    - b. Minimum Joint Width: As indicated on Drawings.
    - c. Maximum Joint Width: As indicated on Drawings.

2. Type of Movement: Seismic.
  - a. Joint Movement: As indicated on Drawings.
3. Slip and Tripping Hazard Performance: Comply with United States Access Board's ADA-ABA Accessibility Guidelines, Section 4.5, Paragraphs 4.5.1 and 4.5.2 for edge height and slopes.

### **2.03 EXTERIOR WALL EXPANSION JOINT COVERS**

- A. Construction Specialties, Inc., shall manufacture expansion joint cover assemblies specified herein and indicated on the drawings. Other manufacturers may be accepted as substitutions only if the manufacturer can demonstrate product compliance with the requirements of the contract documents. Substitution requests must be reviewed prior to bid and must include the following information:
  1. Details
  2. ASTM- E1399 test reports
  3. Mock-ups
  4. Reference list of projects with similar products as those specified herein.
  5. Sample of written 5 year warranty

### **2.04 ROOF EXTERIOR EXPANSION JOINT COVERS**

- A. Bellows Roof Joint Cover: Assembly consisting of metal flanges and elastomeric bellows with an integral water gutter.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; BR Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  2. Application: Roof to Wall (RW-3g).
  3. Fire-Resistance Rating: Not less than that indicated on Drawings.
  4. Exposed Metal:
    - a. Aluminum: Manufacturer's standard.
      - 1) Color: As selected by Architect from full range of industry colors and color densities.
  5. Seal: Preformed Silicone foam elastomeric membrane or extrusion.
    - a. Color: As selected by Architect from manufacturer's full range.

### **2.05 MATERIALS**

- A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate.
  1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.
- G. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.
  - 1. CE-SX Series Silicone Compressive/Extension Seal
  - 2. BBSW-300 Pre-Compressed Secondary Seal, Open Cell Hydrophobic Polymer Impregnated Polyurethane Foam

## **2.06 ALUMINUM FINISHES**

- A. Mill finish.

## **2.07 ACCESSORIES**

- A. Fire Barrier Mats: 2-hour fire-rated intumescent fire barrier mat including expansion joint system where required.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; MetaMat MW Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  - 2. Application: Horizontal.
  - 3. Fire-Resistance Rating: Not less than 2 hours.
- B. Fire Block; refer to the drawings: 1- to 2-hour fire-rated intumescent fire barrier including expansion joint system with shear movement capability.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industrials Company; MetaBlock MB Series or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Nystrom.
  - 2. Application: Horizontal.
  - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
- C. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
  - 1. Provide where indicated on Drawings.
- D. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, setscrews, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Prepare substrates in accordance with expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

### **3.03 INSTALLATION**

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
  - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
  - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  - 4. Install frames in continuous contact with adjacent surfaces.
    - a. Shimming is not permitted.
  - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.
  - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.

3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
  1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- G. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

### **3.04 CONNECTIONS**

- A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 07 71 29 "Manufactured Roof Expansion Joints."

### **3.05 PROTECTION**

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by the work of other Sections.

**END OF SECTION 07 95 13.16**



**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Provide hollow metal doors, door frames and window frames required.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. ANSI A224.1 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
- C. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcements.
- D. ANSI/ISDI-104 -Water Penetration Performance Standard for Insulated Steel Door Systems.
- E. ANSI/ISDSI-103 - Acoustical Performance Standard for Insulated Steel Door Systems.
- F. ANSI/ISDSI-105 - Mechanical Performance Standard for Insulated Steel Door Systems.
- G. ANSI/SDI 100 - Recommended Specifications for Standard Steel Doors & Frames; Steel Door Institute.
- H. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- I. ASTM B 117 - Standard Method of Salt Spray (Fog) Testing.
- J. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
- K. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
- L. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- M. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.
- N. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- O. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure.
- P. NFPA 80 - Standard for Fire Doors and Windows.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- R. SDI 105 - Recommended Erection Instructions for Steel Frames
- S. SDI 111 - Recommended Standard Details - Steel Doors and Frames.
- T. SDI 113 - Test Procedure and Acceptance Criteria for Apparent Thermal Performance for Steel Door and Frame Assemblies.
- U. SDI 114 - Test Procedure and Acceptance Criteria for Acoustical Performance for Steel Door and Frame Assemblies.
- V. SDI 116 - Test Procedure and Acceptance Criteria for Rate of Air Flow Through Closed Steel Door and Frame Assemblies.
- W. Warnock Hersey International Inc. (WHI) - Certification Listings.
- X. Uniform Building Code (UBC).
- Y. UL 10B - Standard for Fire Tests of Door Assemblies.
- Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Underwriters Laboratory Inc.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member of Steel Door Institute (SDI) or Hollow Metal Manufacturers Association (HMMA).
- B. Use skilled workmen thoroughly trained and experienced and completely familiar with specified requirements and methods needed for proper performance of work of this Section.
- C. Codes and Standards:
  - 1. Manufacture labeled units in strict accordance with specifications and procedures of Underwriters Laboratories, Inc. Labels must be affixed to rated assemblies.
  - 2. In guarantee and Shop Drawings, apply and use definitions and nomenclature established in American National Standards Institute publication A 123.1 "Nomenclature for Steel Doors and Steel Door Frames."
  - 3. ANSI/SDI A250.8-2017 - Specifications for Standard Steel Doors and Frames.
  - 4. Fire-Rated Units: **Affix metal plates to jamb side or top of door and/or frame stating the appropriate fire rating. Paper labels will not be accepted. Do not apply paint or stain over metal labels. Mask off the label before applying finish and remove masking after finish is dry.**

## 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protection:
  - 1. Deliver, store, and handle hollow metal units to prevent damage and deterioration.
  - 2. Provide packaging of cardboard or containers, separators, banding, spreaders, and paper wrappings to completely protect hollow metal units during transportation and storage.
  - 3. Store units upright, in protected dry area, at least one inch off ground and with at least 1/4" air space between individual pieces. Protect primed and hardware surfaces.
  - 4. Protect installed work and materials of other trades.
  - 5. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked units to promote air circulation.
- B. Replacements: Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work, otherwise, remove and replace damaged items as directed at Contractor's expense.

## 1.07 WARRANTY

- A. Provide Manufacturer's standard warranty, effective on date of purchase, against defects in product workmanship and materials; minimum 12 months for doors and frames.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Fabricate hollow metal items rigid, neat in appearance, and free from defects, warp, or buckle.
- B. Provide clean cut, straight and true molded members with well-formed and aligned miters.
- C. Dress exposed weld joints smooth for a seamless appearance at frames. **[ and doors. ]**  
Provide interlocking visible edge seams at door panel corners, not at middle of door edge.
- D. Door Clearances: Maximum 1/8" at jambs and heads, 1/8" at meeting edges of pairs of doors, and 3/4" at bottom from finished floor line.
- E. **Close top and bottom edges of exterior doors flush. Seal against water penetration with flush steel channel fillers.**

### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Provide hollow metal units by the following or other approved equal manufacturer:
  - 1. **National Custom Hollow Metal, 800-334-3070, 1701 E 22<sup>nd</sup> St, Little Rock, AR, 72206.** Exterior doors and frames; (Interior doors and frames optional).
  - 2. Amweld
  - 3. Ceco Door Products
  - 4. Curries Company
  - 5. Mesker Door
  - 6. Pioneer
  - 7. Republic

### **2.03 FACTORY PREPARATION**

- A. Prepare units to receive hardware scheduled in "Hardware" Section of these specifications and in accordance with ANSI/DHI A 115.
- B. Cut, mortise, reinforce, drill, and tap units at factory, except drill and tap for surface applied hardware at job when hardware is applied.
- C. Prepare door frames for rubber silencers to be provided with frames.

### **2.04 SHOP PRIME COAT FOR FIELD FINISHED DOORS AND FRAMES**

- A. Clean, treat, and prime exposed surfaces of hollow metal units, including galvanized surfaces. All exterior doors and frames shall be galvanized.

- B. Clean steel surfaces free of mill scale, rust, oil, grease, dirt, and foreign materials before applying paint.
- C. Apply shop coat of rust-inhibiting prime paint of even consistency to provide uniformly finished surface ready to receive finish paint.

## 2.05 FULL FLUSH TYPE DOORS

- A. Construct exterior/interior doors to the designs and gages specified:
  - 1. **Exterior Doors and designated wet areas:** Hot dipped galvanized steel, ASTM A653, ZF180, Class A60 coating, 16 gauge Extra Heavy Duty (except where heavier gauge required), with closed tops.
    - a. Include galvanized components and internal reinforcements.
    - b. Core: Rigid Pre-Formed Closed Cell Polyisocyanurate (polyurethane) Board. 2 lb. PCF Density Average to conform to ASTM D2856.  
Core U- Factor = 0.100, R-Value = 10.0. STC Rating 28-30.
  - 2. **Interior Doors:** Hot Dipped galvanized steel, ASTM A 653, ZF120, Class A40 coating, 18 gauge Heavy Duty (except where heavier gauge required), with no exposed face seams.
- B. **Core material at Interior Doors:** To be either water-resistant honeycomb insulation core glued in place, rigid insulation core glued in place or rigid insulation core foamed in place. Core material at exterior doors is to be either rigid insulation core glued in place or rigid insulation core foamed in place.
  - 1. Rigid Insulation Core (Foamed-in-Place, Interior or Exterior (if Polyurethane)): Non-burning type having compressive strength and shear strength of not less than 20 psi, an insulation to steel bonding strength at least equal to the strength of the insulation, be dimensionally stable within plus or minus 5% volume after 24-hour exposure to temperatures ranging from minus 15° F. to 200° F., have no voids exceeding 1/2" in any direction, and have density of not less than 1.8 pounds per cubic foot.
- C. **Core material at Exterior Doors:** Shall be Polyurethane (ISO) insulation, R-Value 1.97, placed in the hollow core of the door. Verify testing if applicable as a fire rated door.
  - 1. Therma Hold, 800-334-3070 for door and frame, Lab Tested NCHM Thermal Rating Level Per ASTM C1363-19. Insulate Thermal Brake Frame Cavity with Mineral Wool. Caulk Frame Edge to adjacent wall. Apply Gasketing Door to Frame preventing air flow. Include Thermal Break Threshold and Sweep (NGP).
- D. Provide doors complete with glazed panels where required. Glass is specified in Section 08 80 00.
- E. Louvers: Not less than 20 gauge, with inverted V- or Y-shaped blades, set into 18 gauge frame. Provide fusible link, overlapping, operable blades on fire-rated doors.

- F. Astragals: All pairs of doors on which the active leaf has latching hardware shall be provided with overlapping astragals. Exceptions are pairs of doors equipped with vertical rod exit devices and where open back strikes are provided.
1. Exterior openings are to have astragals applied in such a manner as to cover the gap at the meeting stiles at the exterior side.
  2. Doors are to be sized to allow a 1/8" clearance between the meeting edges when an astragal is a part of the assembly as well as when there is no astragal required.
  3. The door supplier shall coordinate the need for astragals based upon the hardware specified and the label requirements of the door manufacturer. Shop drawings shall clearly indicate the type of astragals and where they are to be provided.
  4. The astragals can be either shop or field applied. Field applied astragals are to be shipped with necessary mounting fasteners.

## **2.06 FIRE DOORS**

- A. At fire rated openings, furnish doors bearing Underwriters' Laboratories or Warnok-Hersey label for fire rating required. Furnish overlapping metal astragal on pairs of fire doors except where equipped with approved rim type exit hardware and provided with a removable mullion.
- B. For 1-1/2 hour (B) and 1 hour (B) doors used in stairway enclosures the average temperature developed on the unexposed side shall not exceed 450 degrees F at the end of 30 minutes of standard fire test exposure when tested in accordance with ASTM E 2074. The label attached to the door shall indicate compliance with this requirement.

## **2.07 FULL LOUVERED DOORS**

- A. Form rails and stiles for full louvered doors using 16 gauge cold rolled steel conforming to ASTM Designation A 1008/A 1008M. Furnish inserted sight-proof type securely attached to rails and stiles. Weld assembly joints and grind smooth.

## **2.08 METAL DOORS WITH LOUVERS**

- A. Construct from "Flush Type Doors" with inserted, sight-proof type metal louvers formed of not less than 20 gauge steel. Weld or tenon blades of inserted louvers to frame. Fasten entire assembly to door presenting a neat appearance.

## **2.09 METAL DOORS WITH VISION PANELS**

- A. Construct from "Flush Type Doors" and factory prepare to receive glass vision panels. Furnish non-removable glazing stops on outside of exterior doors and on secure side of interior doors. Furnish glazing beads on inside side of glass panels. Muntins, if required, to interlock at intersections and be securely fastened to door. Glass requirements specified in Section 08 80 00 - Glazing of these specifications.
- B. All doors occurring in a smoke partition are to have an approved, rated vision panel of not less than 100 square inches.

## 2.10 MEDIUM OR NARROW STILE DOORS

- A. Form rails and stiles for medium or narrow stile doors using 16 gauge cold rolled steel conforming to ASTM Designation A 366. Furnish snap-in type glazing beads. Glass requirements specified in "Glazing" Section of these specifications. Weld assembly joints and grind smooth.

## 2.11 WELDED DOOR FRAMES

- A. Construct exterior/interior welded door frames to the designs and gages specified:
  - 1. **Exterior Door Frames and designated wet areas:** Hot dipped galvanized steel, ASTM A 653, ZF180, Class A60 coating, 16 gauge Extra Heavy Duty (except where heavier gauge required), with closed tops.
    - a. Include galvanized components and internal reinforcements.
    - b. **Overhead Rain Drip Guard:** Provide Anodized or Dark Bronze Aluminum Drip Strip 1.5" high x 2.5" wide x required length(s) by NGP, including stainless steel furnished fasteners. Coordinate with Door Hardware Schedule in Section 08 71 00 - Door Hardware. Rain Drip not required where exterior cover provided.
    - c. **Therma Hold Exterior Thermal Break Frames:** Two-part frame applied to Thermal Gasketing and secured every 12" with #8 sheet metal screw. This method separates both sides of the frame jamb and header along the stop to create a barrier preventing temperature transfer from outside to inside.
      - 1) Insulate Thermal Brake Frame Cavity with [ Fiberglass ] Mineral Wool.
      - 2) Use Polyurethane (ISO) Core A60 Galvanneal.
      - 3) Caulk Frame Edge to adjacent wall.
      - 4) Apply Gasketing Door to Frame .
      - 5) Include Thermal Break Threshold and Sweep
  - 2. **Interior Door Frames:** Hot Dipped galvanized steel, ASTM A 653, ZF120, Class A40 coating, 18 gauge Heavy Duty (except where heavier gauge required), with no exposed face seams.
- B. Secure headers and jambs at corners by external welding of faces. Grind smooth to provide invisible joints.
- C. Provide frames with minimum of 3 anchors per jamb for adjoining wall construction and floor anchors for attachment at floor. Construct anchors using minimum 18 gauge steel.
- D. For frames that are to receive concealed closer(s) mounted in the head; provide a cover box to attach to the inside of the frame that will completely cover and protect the closer.
- D. At fire rated openings, furnish frames bearing Underwriters Laboratories, Inc. or Warnock-Hersey, International, Inc. label for fire rating required with anchors approved for type installation required.

## **2.12 FIXED GLASS METAL FRAMES**

- A. Fabricate hollow metal framing using 14 gauge cold rolled steel conforming to ASTM Designation A 366. Apply steel tube glass stops with flush head, countersunk screws, spaced maximum of 12" o.c. unless otherwise required. Fit joints neatly, miter at corners, and make welds invisible by grinding smooth. Provide tamper-proof type anchors.
- B. Anchor frames to wall construction with anchors set not less than 2'-0" o.c. around perimeter of frame.
- C. Glass requirements specified in Section 08 80 00.
- D. At fire rated openings, furnish frames bearing Underwriters Laboratories or Warnock-Hersey International, Inc. label for fire rating required with anchors approved for type installation required.

## **2.13 FIXED LOUVERED SECTIONS**

- A. Provide fixed louver sections in hollow metal framing with louver blades not lighter than 20 gauge steel welded or tenoned to frame and finished to present neat appearance. Provide insect screening on inside of louvers and weatherproof type louver blades for fixed louvers at exterior wall locations.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Examine areas and conditions for work of this Section. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### **3.02 INSTALLATION**

- A. Install hollow metal units in strict accordance with approved Shop Drawings and manufacturer's recommendations.
- B. Set frames accurately, plumbed, aligned, and securely anchored.
- C. Install finish hardware in strict accordance with manufacturers' recommendations. Eliminate hinge-bound conditions, making items operate smoothly with secure locking and latching.

### **3.03 ADJUST AND CLEAN**

- A. Immediately after installation, sand smooth rusted and damaged prime coat. Apply compatible touch-up air-drying primer.



- B. Check and adjust operating finish hardware items, leaving hollow metal units undamaged and in proper operating condition.
- C. Excessive filing or grinding of strike plate will not be accepted. Filing and grinding not to exceed 1/8" in any direction.

**END OF SECTION 08 11 13**

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## **PART 1 - GENERAL**

### **1.01 DESCRIPTION**

- A. Work Included: Provide wood doors, complete. Refer to Door Schedule for types and sizes.

### **1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

### **1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

### **1.04 QUALITY ASSURANCE**

- A. Markings: Furnish door with stamp, brand, or identifying mark indicating door quality and construction. Identifying mark or separate certification to include inspection organization name, identification of standard for door construction, and identity of plant to which stamp was issued.

### **1.05 REFERENCE STANDARDS**

- A. American Society for Testing and Materials: (ASTM) E 152, "Fire Tests of Door Assemblies".
- B. Architectural Woodwork Institute (AWI) Quality Standards: Specifications and Quality Certification Program, Section 1300, "Architectural Flush Doors".
- C. U.S. Dept. of Commerce Commercial Standards: CS 236, "Mat-formed Wood Particle Board".
- D. Rated doors and frames must meet NFPA 80. **Affix metal plates to jamb side or top of door and frame stating the appropriate fire rating. Paper labels will not be accepted. Do not apply paint or stain over metal labels. Mask off the label before applying finish and remove masking after finish is dry.**

## **1.06 WARRANTY**

- A. Warranty: Submit written agreement using door manufacturer's standard form, signed by manufacturer, contractor, and installer, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show photographing of construction below in face veneers, or do not conform to NWMA and AWI tolerance limitations. Warranty period is for lifetime of installation.
- B. Limitation and Exclusions:
  - 1. Defects are not natural variations in color or texture of wood. Improper finishing is considered a defect.
  - 2. Warp not considered a defect unless it exceeds 1/4 inch in the plane of the door itself. Warp is distortion in the door itself and does not refer to relationship of door to frame. Term "warp" includes bow, cup and twist. Amount of warp in door is measured by placing a straight-edge on the suspected concave face of door at any angle (horizontally, vertically, diagonally), with door in installed position. Measurement of bow, cup, and twist is made at point of maximum distance between bottom of straight-edge and face of door.

## **1.07 PRODUCT HANDLING**

- A. Protect wood doors during transit, storage and installation to prevent damage, soiling and deterioration. Comply with the "On-Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.
- B. Protection: Store doors in fully covered, well ventilated area. Protect from extreme changes in temperature and humidity.
- C. Replace damaged doors at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Provide doors manufactured by one of the following:
  - 1. Algoma
  - 2. Eggers
  - 3. Graham
  - 4. Marshfield
  - 5. Mohawk
  - 6. Oshkosh
  - 7. VT Industries

### **2.02 GENERAL**

- A. Provide wood doors complying with applicable referenced standards for specified door kinds and door types.

1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
2. Adhesive: Type II.
3. Core: Structural composite lumber, except when mineral core is required for fire rating.

### **2.03 ACCESSORY COMPONENTS**

- A. Provide metal edges at all concealed vertical rod devices and at fire rated doors. Provide matching hardwood edges at all non-rated doors.
- B. Provide solid wood glazing beads to match door facing at vision panels in non-rated doors and in sound rated doors. Provide metal glazing beads at rated doors with vision panels. Finish on metal glazing bead to match finish on hollow metal door frame.
- C. Astragals: All pairs of doors on which the active leaf has latching hardware shall be provided with overlapping astragals. Exceptions are pairs of doors equipped with vertical rod exit devices and where open back strikes are provided.
  1. Exterior openings are to have astragals applied in such a manner as to cover the gap at the meeting stiles at the exterior side.
  2. Doors are to be sized to allow a 1/8" clearance between the meeting edges when an astragal is a part of the assembly as well as when there is no astragal required.
  3. The door supplier shall coordinate the need for astragals based upon the hardware specified and the label requirements of the door manufacturer. Shop drawings shall clearly indicate the type of astragals and where they are to be provided.
  4. The astragals can be either shop or field applied. Field applied astragals are to be shipped with necessary mounting fasteners.

### **2.04 SOLID CORE, ARCHITECTURAL FLUSH DOORS**

- A. All Solid Core, Architectural Flush Doors are to be manufactured in strict accordance with AWI Section 1300. Furnish, 5-Ply doors with AWI 1300-T-6 Type #5 Edge and with core fully bonded to stiles and rails with Type I Adhesive.
- B. Staved Lumber Core Doors: AWI Type SLC-5ME staved lumber core doors meeting or exceeding requirements of AWI Section 1300.
- C. Fire Rated Doors: AWI Type FD-5. Provide fire retardant treated wood blocking inside labeled doors to receive door hardware.
  1. Furnish fire doors tested in accordance with ASTM Standard E 152 of latest issue and bearing Underwriters' Laboratories, Inc. label for fire rating required. Refer to door and frame schedule in drawings for fire rating.
  2. For 1-1/2 hour (B) and 1 hour (B) doors used in stairway enclosures the average temperature developed on the unexposed side shall not exceed 450 deg.F. at the end of 30 minutes of standard fire test exposure when tested in accordance with ASTM E152. The label attached to the door shall indicate compliance with this requirement.

3. Positive Pressure Requirements for all doors with a fire rating greater than 20 minutes:
  - a. Fire doors must comply with positive pressure testing requirements of UL 10C.
  - b. Category: Provide Category "A" doors with no visible intumescent on doors or frames.
  - c. Smoke Label: Certify all fire doors to comply with smoke seal requirements and apply an "S" label.
  
- D. Face Veneers:
  1. Painted Finish: Provide "A" Grade per AWI 1300, minimum 1/50" thick face veneers using Premium Quality, Medium Density Overlay.
  2. Stained Finish: Provide "A" Grade per AWI 1300, minimum 1/50" thick face veneers using Premium Quality. Matched (pairs of doors to be Pair Matched), Slip-Running.
    - a. Veneer Cut:
      - 1) Plain Sliced White Oak
    - b. Finish stain to be custom color selected by Architect.
  
- E. All doors occurring in a smoke partition are to have an approved, rated vision panel of not less than 100 square inches.

## **PART 3 - EXECUTION**

### **3.01 FABRICATION**

- A. Fabricate wood doors complying with Contract Drawings, with this Section and with the referenced standards for types specified.
  
- B. Prefit doors at factory with following clearances:
  1. 1/8" on top and hinge side
  2. 1/8" on lock edge of single doors
  3. 1/16" per leaf on pair meeting edges
  4. 1/2" from finished floor
  5. 3/4" max. from combustible floor
  6. 3/8" max. from non-combustible sill or threshold
  7. Bevel both edges of door (1/8" in 2"). Specific clearances to be shown on door schedule. Field trimming of fire doors will not be allowed.
  8. Seal and refinish edges that are field cut to match factory finish.
  
- C. Pre-machine doors for hardware as required by Hardware Schedule in Bid Documents and in accordance with requirements of AWI Section 1300. Hardware Schedule by hardware supplier to be furnished complete with templates for all hardware requiring door preparation. Hollow metal frame schedule to be furnished and to include exact location and size of hardware preparation. No door machining to be required for any totally surface-mounted hardware.

### **3.02 FACTORY FINISH**

- A. Factory finish doors in accordance with requirements of AWI Section 1500 for Custom finish.
  - 1. Finish System: AWI Section 1500, Conversion Varnish with custom stain color to be selected by architect.
    - a. Close Grain Woods:
      - Washcoat
      - Custom Stain
      - Sealer
      - Sand
      - Top Coat
      - Top Coat
    - b. Open Grain Woods:
      - Custom Stain
      - Sealer
      - Sand
      - Top Coat
      - Top Coat
  - 2. Apply factory finish to both faces and all edges including top and bottom of all doors.

### **3.03 INSPECTION**

- A. Examine door frames and verify frames are correct type and have been installed for proper hanging of corresponding doors.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Architect.
- C. Install doors only after completion of other work which would raise moisture content of doors or damage surface of doors.

### **3.04 INSTALLATION**

- A. Fit, hang, and trim doors by openings.
- B. Seal cuts made on job immediately after cutting, using clear water-resistant varnish or sealer.
- C. Excessive filing or grinding of strike plate will not be accepted. Filing and grinding not to exceed 1/8" in any direction.

**END OF SECTION 08 14 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Provide doors and grilles specified including hardware, operating devices, and accessories for complete installation.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 GUARANTEE**

- A. Warranty provisions for Work under this Contract are specified in General Conditions. Supplementary to General Conditions, furnish written guarantee stating work is guaranteed to serve intended purpose under normal use and that defects in materials and workmanship within 1-year period after Contract substantial completion date will be repaired, replaced or made good at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER**

- A. Provide doors manufactured by Overhead Door Corp., Dallas, Texas, 1-800-275-3290, or approved equal.
  - 1. ASTA AMERICA by Janus International, 800-423-0659.
  - 1. Clopay Commercial Door Products, 800-225-6729.
  - 2. Raynor Worldwide, 888-598-4790.
  - 3. Wayne-Dalton, 855-493-3667.
  - 4. Cornell Innovative Door Solutions, 877-640-8825.

## 2.02 ROLLING METAL COUNTER DOORS WITH INTEGRAL FRAME

- A. Stainless Steel Counter Doors with Integral Frame: Overhead Door Corporation, **657 Series**.
1. Curtain: Interlocking roll-formed stainless steel slats with a #4 finish and with endlock for curtain alignment. Slats, 22 gauge stainless steel with stainless steel tubular bottom bar with neoprene astragal.
  2. Integral Frame and Sill: Integral stainless steel frame with a #4 finish and a stainless steel sill. Frame consists of 16 gauge jambs and header, with 14 gauge sill.
  3. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch (0.8 mm) per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.
  4. Hood: Stainless steel with a #4 finish and provided with intermediate support brackets as required.
  5. Operation:
    - a. Manual push up.
  6. Locking:
    - a. Padlockable slide bolts on coil side.
  7. Wall Mounting Condition:
    - a. Between jambs mounting installed in an existing opening.

## 2.03 ROLLING COUNTER DOORS (ALUMINUM)

- A. Anodized Aluminum Counter Doors: Overhead Door Corporation **652 Series**.
1. Wall Mounting Condition:
    - a. Face-of-wall mounting.
  2. Curtain: Interlocking slats, Type F-158 fabricated of anodized aluminum. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.
  3. Finish:
    - a. Anodized Finish:
      - 1) Slats and hood clear anodized aluminum.
  4. Bottom Bar: Extruded aluminum tubular shape with astragal.
  5. Guides: Extruded aluminum.
  6. Brackets: Steel plate to support counterbalance, curtain and hood.
  7. Finish; Bottom Bar, Guides, Brackets:
    - a. Finish: PowderGuard Premium powder coat, color as selected by the Architect.
  8. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel.
  9. Hood: Provided with intermediate support brackets as required and fabricated of:
    - a. Aluminum.
  10. Operation:
    - a. Manual push up.
  11. Locking:
    - a. Slide bolt locks suitable for use with padlock.

## 2.04 SIDE FOLDING SECURITY GRILLES

- A. Side-Folding Open Aluminum Grilles: Overhead Door Corporation Model 683.
1. Curtain: Constructed of 1/8 inch by 5/8 inch by 6 inch horizontal clear anodized aluminum links that slide into 5/16 inch vertical rods. Links held in place by 1/2 inch clear anodized aluminum (S-126) spacer tubes on alternate rods.
    - a. Panel Width: 6-5/16 inch.
    - b. Pattern: Brick
  2. Finish:
    - a. Aluminum clear anodized.
  3. Track:
    - a. Trolley assemblies shall be 1-1/8 inch and adjustable 1 inch upward or downward without the removal of the curtain.
    - b. Track shall be heavy extruded aluminum 1-3/8 inch wide by 1 5/8 inch high.
    - c. Curves:
      - 1) 90 degrees.
      - 2) 120 degrees.
      - 3) 135 degrees.
      - 4) 150 degrees.
      - 5) Radius: 14 inch radius.
  4. Locking:
    - a. Provide lead post with a concealed hook bolt lock activated by a keyed cylinder [or thumb turn] that engages a full height wall channel. Where required, provide a top and bottom spring loaded locking post with interior thumb turn and protection or keyed cylinder and dust-proof floor sockets for all drop bolts. Provide rubber bumper at the edge of locking post.
    - b. Traveling end post shall have an attached full height protection plate and shall be self locking into a steel V-stop. End posts are fixable to a wall when stacked in the opening using top and bottom locking posts. Key locks to building master.
    - c. Intermediate posts:
      - 1) Floor mounted provide intermediate posts a maximum of 10 feet (3048 mm) of curtain length.
      - 2) For counter mounts and at each curve provide intermediate posts a maximum of 6 feet.
      - 3) Intermediate posts contain an adjustable concealed spring loaded drop bolt with cylinder locks keyed alike. Provide with dustproof floor sockets for all drop bolts.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine substrates and conditions under which overhead rolling doors are to be installed. Do not proceed until unsatisfactory conditions are corrected.

### **3.02 INSTALLATION**

- A. Install door and operating equipment, complete with necessary hardware, jamb and head mold strip, anchors, inserts, hangers, and equipment supports complying with final Shop Drawings, and manufacturer's installation instructions.
- B. Install rated doors complying with UL Specifications, if applicable.
- C. Lubricate, test, and adjust doors to provide easy operation, proper closing, and secure locking.
- D. Instruct Owner in operation and maintenance of doors.
- E. Touch up scuffs and abrasions in finish paint.

**END OF SECTION 08 33 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Provide doors specified including hardware, operating devices, and accessories for complete installation.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 GUARANTEE**

- A. Warranty provisions for Work under this Contract are specified in General Conditions. Supplementary to General Conditions, furnish written guarantee stating work is guaranteed to serve intended purpose under normal use and that defects in materials and workmanship within 1-year period after Contract substantial completion date will be repaired, replaced or made good at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER**

- A. Provide doors manufactured by Overhead Door Corp., Dallas, Texas, 1-800-275-3290, or approved equal.
  - 1. Clopay Commercial Door Products, 800-225-6729.
  - 2. Raynor Worldwide, 888-598-4790.
  - 3. Wayne-Dalton, 855-493-3667.

**2.02 INSULATED SECTIONAL OVERHEAD DOORS**

- A. Insulated Steel Sectional Overhead Doors: Thermacore® 596 Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:

1. Door Assembly: Insulated steel door assembly with rabbeted meeting rails to form weathertight joints and provide full-width interlocking structural rigidity.
  - a. Panel Thickness: 2 inches.
  - b. Exterior Surface: Flush Panel.
  - c. Exterior Steel: 20 gauge, galvanized.
  - d. End Stiles: 16 gauge with thermal break.
  - e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.
    - 1) Standard cycle spring: 10,000 cycles.
  - f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
  - g. Thermal Values: R-value of 17.40; U-value of 0.057.
  - h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
  - i. Sound Transmission: Class 26.
  - j. Pass-Door:
    - 1) Provide with optional pass door.
  - k. High-Usage Package: Provide with optional high-usage package.
  - l. Full Glazed Aluminum Sash Panels:
    - 1) 1/2 inch (12.5 mm) Double Strength Insulating Glass.
2. Finish and Color:
  - a. Two coat baked-on polyester:
    - 1) Interior color, white.
    - 2) Exterior color, custom RAL.
3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:
  - a. Keyed lock.
6. Weatherstripping:
  - a. EPDM bulb-type strip at bottom section.
  - b. Flexible Jamb seals.
  - c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
  - a. Size:
    - 1) 2 inch (51 mm).
    - 2) 3 inch (76 mm).
  - b. Type:
    - 1) High lift.
8. Manual Operation: Chain hoist.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **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. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

### **3.04 CLEANING AND ADJUSTING**

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

### **3.05 PROTECTION**

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

**END OF SECTION 08 36 13**



**PART 1 - GENERAL**

**1.01 SCOPE**

- A. Provide aluminum doors, framing and hardware specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Fabricate exterior door and frame units to withstand the wind pressure loading shown or, or if not shown, 20 lbs. per sq. ft. on the gross area of the frames, doors, panels and glass, acting inward and also outward.

**1.05 WARRANTY**

- A. Submit a warranty signed by the manufacturer, contractor, installer, agreeing to replace aluminum doors, windows, framing and glazing which fail in materials and workmanship within 2 years of the date of acceptance. Failure of materials or workmanship shall include, but not be limited to, failure in operation of doors, windows, and hardware, excessive leakage of air infiltration, excessive deflections, delamination of panels, deterioration of finish or metal in excess of normal weathering, and defect in accessories, weatherstripping, and other components of the work.
  - 1. Submit 10-year warranty by manufacturer of polyvinylidene fluoride (PVDF) coating.

**1.06 ADJUSTMENT**

- A. After installation, make adjustments as necessary to insure proper operation of all hardware items.

- B. Door Opening Force: In accordance with the Americans With Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:
  - 1. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.
  - 2. Exterior hinged doors: 8.5 lbf
  - 3. Interior hinged doors: 5.0 lbf
  - 4. These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.
  
- C. Door Closer: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position of 70°, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Manufacturers who produce products that may be submitted to Architect for review are:
  - 1. Kawneer (Basis-of-Design)
  - 2. Oldcastle Building Envelope (OBE)
  - 3. Tubelite
  - 4. YKK AP America Inc.
  - 5. EFCO
  - 6. Approved equal

**2.02 SWINGING GLASS DOORS**

- A. Kawneer Series 500 Wide Stile, or approved equal, single acting, sizes as indicated, complete with all hardware, including cylinders. Provide bottom rail to meet minimum ADA criteria or as indicated on the drawings.

Material Standard: ASTM B 221; 6063-T6 alloy and temper.

- 1. The door stile and rail face dimensions of the 500 entrance door will be as follows:

Door	Vertical Stile	Top Rail	Mid Rail	Bottom Rail
500	5"	5"	6"	10" (to meet ADA)

- 2. Major portions of the door members to be 0.125" nominal in thickness and glazing molding to be 0.05" thick.

- B. Door Corner Warranty Period: Limited Warranty shall begin at substantial completion. In addition, door corner construction shall be supported with a LIMITED LIFETIME WARRANTY for the life of the door under normal use.

- C. Finish:
  - 1. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard complete line.
    - a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.

### **2.03 ALUMINUM FINISHES**

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
  - 1. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color: Medium Bronze)

### **2.04 FRAMING**

- A. Door, Storefront, and Windows: Provide standard shapes and moldings of Kawneer EnCORE® glazed framing system or approved equal.
  - 1. Center Set
- B. Finish:
  - 1. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard complete custom line.
    - 1. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
- D. Aluminum Sheet Breakmetal: Provide 3003-0 alloy.

### **2.05 ALUMINUM SUB-SILL FLASHING**

- A. Aluminum window and framing supplier is to provide aluminum sub-sill flashing "pans" of same aluminum alloy as frames and of minimum .050" thickness. Form pans by turning up ends and interior side 1-1/2". Lap end splices minimum of 2". Provide in maximum length possible to minimize number of splices. Apply bituminous paint to concealed surfaces in contact with dissimilar metal, concrete or mortar. Set sub-sill in continuous bed of sealant and seal around all anchors penetrating sub-sill. Do not anchor window sill through sub-sill for openings 5' or less in width. For windows greater than 5' in width, anchor window sill through sub-sill at manufacturer required locations. Fill screw holes to full depth with sealant and install anchor. Apply 2 ribbons of sealant at 2" lap. Finish shall match aluminum frame.

### **2.06 ALUMINUM FLASHING MATERIAL**

- A. Aluminum Sheet: Provide 3003-0 alloy for all related flashing.

- B. Finish:
  - 1. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard complete line.
    - 1. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.

## **2.07 OTHER MATERIALS**

- A. Provide all other materials, not specifically described but required for a complete, weathertight, and proper installation of doors, windows, and framing systems, subject to acceptance by the Architect.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in compliance with manufacturer's recommendations and accepted shop drawings. Set units plumb, level and true to line, without warp or rack of framing, windows, and doors. Anchor securely in place. Secure to structure with non-staining, non-corrosive shims, anchors, fasteners, spacers, and fillers. Use care in erection so as not to mar, abrade, or stain finished surfaces. Where aluminum is to be placed in contact with steel, concrete and other dissimilar surface, back paint the aluminum before erection with an acceptable bituminous paint.
- B. Seal frames with a Silicone approved sealant in color to match frames, making a neat fully weatherproof job. Refer to Section 07 92 00, and comply with requirements of that section.
- C. Protection: After erection, adequately protect by masking, light motor oil, vaseline or other acceptable covering all exposed parts of the work and the finish from damage by grinding and polishing machines and/or by plaster, lime, cement, acid or other harmful substances.
- D. Cleaning: After completion of all other work in the vicinity of the aluminum doors, windows, and framing, remove all masking, vaseline and/or other covering used to protect the work, and thoroughly clean the aluminum surfaces with soap and plain water or a petroleum product such as white gasoline, kerosene, or distillate. Do not use abrasive cleaning agents.

**END OF SECTION 08 41 13**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install aluminum curtain wall with glass specified.
- B. It is the curtain wall manufacturer's responsibility to perform the following:
  - 1. Design and provide all curtain wall support brackets, attachments and support steel as necessary to fully support all curtain wall systems as required by drawings and specifications.
  - 2. Design and provide expansion and contraction capabilities for all curtain wall system.
  - 3. All curtain wall systems shall be designed by a structural engineer, licensed in the State of Arkansas.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
  - 1. Submit for approval, structural calculations for all work of this section. Comply with current design rules of the Aluminum Association, AISC, AISI and ACI. Include analysis for wind and dead load on framing members, anchors and concrete inserts. Show section property computations for framing members and submit full size die drawings. Existing test reports are not an acceptable substitute for calculations. In no case shall glass be considered as a lateral brace for framing members.
  - 2. When calculating members with a thermal break, calculations shall be conducted as if the aluminum sections on either side of the thermal break are additive sections, not a composite section. At the manufacturer's option, calculations can be submitted with composite action type members, if and only if, physical testing is conducted by an independent laboratory on the actual framing members being calculated and if a complete stress analysis is conducted on the thermal break material.
  - 3. Glass Analysis: Submit for record only, glass manufacturer's wind and snow pressure analysis and thermal analysis showing that the specified maximum probabilities of breakage are not exceeded.

4. Suitability For Structural Silicone Glazing: Submit for record only, glass manufacturer's written statement that any insulated glass, reflective glass and spandrel glass which is supported by structural silicone is suitable for such application.
5. Silicone Adhesion Tests: Submit for record only, sealant manufacturer's test reports for structural silicone and weather seal silicone adhesion to all relevant substrates. Tests must include seven day water immersion after which silicone must have excellent adhesion to substrates. Report adhesion to substrates. Report adhesion strength in terms of shear stress and tensile stress. Test samples shall approximate sealant joint sizes and configurations intended for production materials.
6. Structural Silicone Substrate Tests: Submit for record only, written test reports showing that for each condition using structural silicone, a minimum of six samples have been loaded for a minimum of one minute so as to produce a nominal stress on the silicone of 120 psi. Prior to load tests, all samples must be subjected to water immersion for seven days. Apply the load in such a manner that the force per linear inch generated by 120 psi silicone stress is transferred through all elements in the sandwich, including insulated glass edge seals. All six samples of each set must withstand the specified loading with no failure of any element. Failure of any one sample requires a new set of six samples to be tested. Apply load in 20 psi. increments held for a minimum of one minute each.
7. Show clearly on shop drawings where and how manufacturer's system deviates from contract drawings and these specifications.
8. Architect reserves right to require fabrication samples showing prime members, joiner, anchorage, expansion provisions, glazing and similar details, profiles and intersections.

B. Substitutions will not be considered prior to the award of the General Contract.

#### **1.04 PRODUCT HANDLING**

- A. Protection: Protect curtain wall components, glass, and glazing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Minimum wind design pressures (PSF), both inward and outward and acting perpendicular to glass and panels (including return surfaces), shall be as follows:

<u>HEIGHT</u>	<u>TYPICAL WALL</u>
0-50 ft.	20
51-200 ft.	25

- B. Dead load is actual weight of materials.
- C. Limit deflections and stresses as follows:
1. Normal to the plane of glass and panels, deflection of framing members is not to exceed  $L/175$  for spans up to 13'-6" &  $L/240 + 1/4$ " for spans over 13'-6" tall. Where a sealant joint occurs between a framing member and a relatively stiff building element, deflection of the framing member shall not exceed 1/2 of the joint width or less if required by sealant manufacturer.
  2. In the plane of glass and panels, deflection of framing members shall not reduce the glass or panel edge clearance below 25% of the design dimension or 1/8", whichever is greater. Restrict deflection further if required for assembly and fit of components.
  3. At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 1/16". Where connection points are not clearly defined, maximum anchor deflection shall not exceed 1/16".
  4. Stresses shall not exceed the allowable values established by the specifications. In no case shall allowable values exceed the yield stress. For load combinations, a reduction in load or increase in allowable stress (but not both) may be permitted only if permitted by code.
  5. Tensile or shear stress in structural silicone sealant joints shall not exceed 20 psi. or less if required by sealant manufacturer. In no case shall structural silicone be used to support glass or panel dead load in shear. Where structural silicone supports wind pressure in tension and shear, the shear contribution shall be neglected.
- D. At 1-1/2 times design pressure, net permanent deflections of framing members must not exceed 1/1000 of span length and components must not experience failure, gross permanent distortion or disengagement or glass breakage. At connection points of framing members to anchors, anchor deflection in any direction shall not exceed 1/8" and permanent set shall not exceed 1/16". Where connection points are not clearly defined, maximum anchor deflection and permanent set shall not exceed 1/8" and 1/16" respectively.
- E. Provide clearance for thermal movement for a minimum 100 degrees F. material temperature increase and decrease. Provide additional clearance as required to accommodate erection tolerance. All components including adhesives and sealants must be able to withstand the specified temperature change with simultaneous wind and snow loads.
- F. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft<sup>2</sup> at a static air pressure differential of 6.24 psf.
- G. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 15 psf as defined in AAMA 501.

- G. Water Infiltration:
1. Water infiltration is defined as any leakage that is not contained and drained away in such a manner as to cause no damage to or degrade the function or appearance of any portion of this building or its contents.
  2. Provision shall be made in the design to drain to the exterior any leakage of water occurring at joints and/or any condensation taking place within the construction.
  3. No infiltration under static pressure shall occur for conditions defined by NAAMM TM-1-68T, Section 4.4 at a differential static pressure of 15 psf (1.92" H<sub>2</sub>O).
  4. No infiltration under dynamic pressure shall occur for conditions defined by NAAMM TM-1-68T, Section 4.5. Delete paragraph 4.5.3. Minimum pressure for paragraph 4.5.4 shall be 15 psf with a minimum slip stream velocity of 90 mph based on ASTM.
  5. Field water tests in accordance with NAAMM FC-1-69 may be performed on completed portions of the wall at the Architect's option. In the event that such testing should result in uncontrolled leakage, eliminate the causes of such leakage at no additional cost to the Owner. Remedial measures must maintain standards of quality and durability and are subject to review by Architect.
- H. Perform test of structural performance in accordance with NAAMM TM-1-68T, Section 4.6. Deflection limitations are listed above.
- I. After test for structural performance, apply pre-load of positive 3/4 times design pressure and zero all gages. Apply a positive pressure of 1-1/2 times design pressure and record deflections and permanent sets. Performance criteria are listed above. Repeat for negative 3/4 and negative 1-1/2 times design pressure.
- J. The general method of water leakage control shall be internal gutters which are drained to the exterior. Vertical walls which consist solely of glazed openings shall have an isolated gutter cavity at each glass perimeter so that any leakage is confined to and weeped from the opening of leakage origin.
- K. Testing Sequence for Curtain Wall:
1. Air Infiltration
  2. Static Water Infiltration
  3. Dynamic Water Infiltration
  4. Structural Performance at Design Pressure
  5. Structural Performance at 1-1/2 Times Design Pressure
- L. Glass Performance: Wind pressure is assumed to have a one minute duration. Snow pressure is assumed to have a one week duration. Upon first application of design wind and snow pressures for the specified durations, probability of breakage shall not exceed 8/1000 for vertical glass and 1/1000 for horizontal and sloped glass. An exception is glass tested to 1.5 times design pressure in a mock-up; probability of breakage shall not exceed 20/1000. Probability of breakage relative to glass thermal stress shall not exceed 8/1000 for vertical glass and 1/1000 for horizontal or sloped glass.



- M. Structural Silicone Assembly Performance: Structural silicone must have an ultimate strength of at least 120 psi in tension and shear. The force per linear inch generated by this stress must be transmitted without failure by paint films, insulated glass edge seals, laminated glass interlayers, laminated panel cores, glass frits, glass scrims, glass coatings and all other elements in the line of stress.
- N. Field Adhesion Tests of Sealants: Periodically check sealants in place for adhesion using methods recommended by sealant manufacturer. Promptly replace any sealant which fails to develop proper adhesion or which fails to cure.
- O. Cladding system must provide for manufacturing tolerances, setting tolerance, column settlement and beam deflections. The structural engineer will quantify dead load deflection, live load deflection, long term creep deflection and differential column settlement. The deflections are not necessarily uniform from floor to floor and do not necessarily occur at the same time. Structural design considerations shall be 1/4" column settlement over 30' structural bay, 1/4" mid-span live load deflection and 4/10" lateral drift (average over entire height of building) floor to floor.

## 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.
- C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight-lines, to one another, and to adjoining construction.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample submissions and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups for type(s) of curtain wall elevation(s) indicated, in location(s) shown on Drawings.

## 1.07 WARRANTY

- A. Submit written warranty agreeing to repair or replace defective materials and workmanship during the warranty period as follows:
  - 1. General Warranty period is two (2) years from date of final acceptance.
  - 2. Submit Standard 5-year warranty by manufacturer of Permacoat™ Powder Coating meeting AAMA 2604.
  - 2. Submit 10 year warranty on fluorocarbon finish system (AAMA 2605).

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturers who produce products that may be submitted to the Architect for review are:
  - 1. Kawneer 1600 Wall System™1 and 2 Curtain Wall (**Basis-of-Design**)
    - a. Frame depth options: 2-1/2" x 7-1/2", outside glazed, structural silicone glazed (SSG) format, with 1" insulating glass and 1/4" monolithic glazing.
  - 2. Oldcastle BuildingEnvelope™ Reliance Wall System
  - 3. Tubelite® 400SS Screw Spline Curtainwall
  - 4. YKK AP America
  - 5. Approved equal

### 2.02 MATERIALS

- A. Extrude aluminum components from 6063-T-5 aluminum alloy. Provide a minimum nominal wall thickness of 1/8" for structural members and 1/16" for non-structural members. Standard commercial tolerances, as listed in "Aluminum Standards and Data", shall apply to finished, fabricated and assembled materials.
- B. Finishes:
  - 1. Factory finish with oven cured Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard complete line.
    - a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
    - b. Color: Medium Bronze.

### 2.03 GLAZING MATERIALS

- A. Gaskets and Weatherstrips except at Structural Silicone Glazing:
  - 1. Provide sponge gaskets of extruded black neoprene with a Shore A hardness of 40 conforming to ASTM C509. Gaskets to allow 20-35% compression.
  - 2. Provide dense gaskets of extruded black neoprene with a Shore A hardness of 75 for hollow profiles and 60 for solid profiles and conforming to NAAMM SG-1-70.

- B. Gaskets at Structural Silicone Glazing: Provide black, non-cured silicone rubber. Use Type 1 where adhesion is not desired and Type 2 where adhesion is desired.
- C. Setting Blocks:
  - 1. Provide black solid extruded neoprene with a Shore A hardness of 85, minimum length of 4" and a minimum width corresponding to the glass thickness. Locate at quarter points.
  - 2. Extruded silicone setting blocks are required where in contact with silicone sealant.
  - 3. Shims are to be of same material, hardness, length and width as setting blocks.
- D. Side Blocks:
  - 1. Locate side blocks within upper half of each jamb for each light. Blocks shall have Shore A hardness of 55 and shall be solid neoprene. Install with 1/8" clearance between block and bearing surface.
  - 2. Side blocks are not required when an individual glass light is continuously sealed with silicone at two or more edges.
- E. Lockstrip Gaskets:
  - 1. Lockstrip gaskets shall be spline-type extruded black neoprene with a Shore A hardness of 75 and conforming to ASTM C542.
  - 2. Lip seal pressure shall be a minimum of 4 lb./linear inch and a maximum of 10 lb./linear inch.
  - 3. Prior to installing the locking strip, apply a perimeter bead of silicone sealant between the inside surface of the glass and the lockstrip gasket.

#### **2.04 MISCELLANEOUS MATERIALS**

- A. All screws, bolts, nuts, washers and rivets shall be 300 Series, non-magnetic stainless steel or cadmium plated steel.
- B. Provide lock washer or other locking device at all bolted connections.
- C. All hot rolled steel shapes and plates shall conform to ASTM A26.
- D. Provide weep hole filters of 45 pore/inch, open cell, urethane foam compressed 30-50%.

#### **2.05 SEALANTS**

- A. Shop Applied: Provide GE Silpruf or Dow Corning 795 shop applied silicone sealant, or approved equal.
- B. Field Applied:
  - 1. Structural sealant for glazing perimeter shall be GE 1200, Dow Corning 999, or approved equal.

2. For other joints, select an appropriate sealant for the type of joint, movement and substrates involved. Acceptable products include Tremco Dymeric, GE 1200, Dow Corning 999, GE Silpruf, Dow Corning 795, Tremco Curtainwall Sealant, Dow Corning 790, PTI 606 Butyl Tape, Tremco Polyshim Tape, or approved equal.

## **2.06 HIGH PERFORMANCE SUB-SILL RECEPTOR**

- A. Thermally Broken High Performance sub-sill receptor extrusion designed for the specified system shall be provided. Do NOT attach vertical mullions to sub-sill with screws at captured clips inside framework. Aluminum Sub-Sill Flashing in 2.06 above shall be incorporated in addition to this High-Performance Sub-Sill Receptor.

## **2.07 ALUMINUM FINISHES**

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
  1. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color: Medium Bronze)

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install complete with components set plumb, square, level, at their proper elevation and plane, and located in proper alignment with all work. Protect exposed aluminum from damage by grinding and polishing machines, lime, acid, cement, and harmful compounds.
- B. Erection Tolerances: Adjust work to conform with the following tolerances.
  1. Plumb: 1/8" in 10'; 1/4" in 40'.
  2. Level: 1/8" in 20'; 1/4" in 40'.
  3. Limit offset of member alignment to 1/16" where surfaces are flush or less than 1/2" out of flush and separated by less than 2"; otherwise limit offsets to 1/8".
  4. Location: 3/8" maximum deviation from measured theoretical location.
- C. Firestopping "Safing" Insulation: Clean debris from behind window wall during erection and provide temporary closures to prevent accumulation. Install firestopping to comply with governing regulations and with AAMA RI-A3. Install firestopping with securely anchored metal flanges or equivalent provisions to prevent dislocation.

### **3.02 CLEANING**

- A. Clean aluminum and insulating panels. Clean aluminum thoroughly with plain water or solvent recommended by curtain wall manufacturer. Do not use abrasive cleaning agents. Contractor responsible for damages resulting from use of cleaning materials.

**END OF SECTION 08 44 13**

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**4" INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL WALL SYSTEM****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
  - 1. Flat insulated, translucent sandwich panels
  - 2. Aluminum clamptite installation system
  - 3. Aluminum sill flashing

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
    - a. Sandwich panels: 7" x 12" units
    - b. Factory finished aluminum: 3" long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - 1. Reports required (if applicable) are:
    - a. Flame Spread and Smoke Developed (UL 723) - Submit UL Card
    - b. Burn Extent (ASTM D 635)
    - c. Color Difference (ASTM D 2244)
    - d. Impact Strength (UL 972)
    - e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
    - f. Bond Shear Strength (ASTM D 1002)

- g. Beam Bending Strength (ASTM E 72)
- h. Insulation U-Factor (NFRC 100)
- i. NFRC System U-Factor Certification (NFRC 700)
- j. NFRC Visible Light Transmittance (NFRC 202)
- k. Solar Heat Gain Coefficient (NFRC or Calculations)
- l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)
- m. Air Leakage (ASTM E 283)
- n. Structural Performance (ASTM E 330)
- o. Water Penetration (ASTM E 331)
- p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM E2707)

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
  - 1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
  - 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
  - 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.
- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing Kalwall panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

#### 1.05 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
  - 1. When requested, include span analysis data.
  - 2. Standard panel system shall have less than 0.01 cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
  - 3. Structural Loads. Provide system capable of handling the following loads:
    - a. Positive Wind Load (PSF): Refer to structural drawings data.
    - b. Negative Wind Load (PSF): Refer to structural drawings data.



- B. Deflection Limits:
  - 1. Walls: Limited to L/60 of clear span for each assembly component.
- C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

## **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## **1.06 WARRANTY**

- A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship, within one year from the date of delivery. Failure of material or workmanship shall include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.
- B. Extended Panel Warranty: 5 years Materials and Workmanship from date of delivery.
- C. Extended Manufacturer's factory applied Finish Warranty: 10 years Limited Warranty covering separation of faces from grid core affecting structural strength, reinforcing fiberbloom and/or abnormal color change of the exterior face sheet from date of delivery.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project subject to compliance with the performance requirements of this specification and submission of evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.
- B. Kalwall Corporation, Tel: (800) 258-9777 - Fax: (603) 627-7905 - Email: [info@kalwall.com](mailto:info@kalwall.com)

## 2.02 PANEL COMPONENTS

### A. Face Sheets:

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
  - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
  - b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
2. Interior face sheets:
  - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 450 when tested in accordance with UL 723.
  - b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
  - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
  - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
  - c. Erosion Protection: Integral, embedded-glass erosion barrier.
4. Appearance:
  - a. Exterior face sheet: Smooth, 0.070" thick and Crystal in color.
  - b. Interior face sheet: Smooth, 0.045" thick and Crystal in color.
  - c. Face sheets shall not vary more than  $\pm 10\%$  in thickness and be uniform in color.

### B. Grid Core:

1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 2", thermoset fiberglass composite. Poured and de-bridged thermal break is not acceptable.

### C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.

3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
  - a. 50% Relative Humidity at 68° F: 540 PSI
  - b. 182° F: 100 PSI
  - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
  - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

### **2.03 PANEL CONSTRUCTION**

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
  1. Thickness: 4 inches
  2. Grid Core Insulation: Fill panel cores with fiberglass batt.
  3. Panel U-factor by NFRC certified laboratory: 4" thermally broken grid 0.15.
  4. Complete insulated panel system shall have NFRC certified U-factor of <Insert NFRC U-factor >
  5. Visible Light Transmittance (VLT):
    - a. Visible LT (NFRC 202) by NFRC certified laboratory: 17%. For Crystal/Crystal face sheet combinations only.
  6. Solar heat gain coefficient 0.09
  7. Grid pattern as viewed: Nominal size: 12" x 24"; pattern: Reverse Shoji
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
  1. Absence of flame penetration through the wall assembly at any time.
  2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
  3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.
- D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

### **2.04 ALUMINUM CLAMPTITE INSTALLATION SYSTEM**

- A. Aluminum clamp-tite installation system:
  1. Thermally Broken-Flat extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamp-tite installation system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum clamp-tite installation system, excluding final fasteners to the building.

- D. Finish:
  - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards: Bone White #21B.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Installer shall examine substrates, supporting structure, and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
  - 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

#### **3.03 INSTALLATION**

- A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.
  - 1. Anchor component parts securely in place by permanent mechanical attachment system.
  - 2. Accommodate thermal and mechanical movements.
  - 3. Seal aluminum clamp-tite installation system as shown on the manufacturer's fabrication drawings and suggested installation instructions.

#### **3.04 FIELD QUALITY CONTROL**

- A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

#### **3.05 CLEANING**

- A. Clean the panel system, interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

**END OF SECTION 08 45 23**

**PART 1 - GENERAL**

**1.01 SUMMARY**

**A. Section includes:**

1. Mechanical and electrified door hardware
2. Electronic access control system components

**B. Section excludes:**

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

**C. Related Sections:**

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
  - a. "Metal Doors and Frames"
  - b. "Flush Wood Doors"
  - c. "Stile and Rail Wood Doors"
  - d. "Interior Aluminum Doors and Frames"
  - e. "Aluminum-Framed Entrances and Storefronts"
  - f. "Stainless Steel Doors and Frames"
  - g. "Special Function Doors"
  - h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

**1.02 REFERENCES**

**A. UL LLC**

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
  - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
  - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
  - a. Wiring Diagrams: For power, signal, and control wiring and including:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

- a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
- a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
  - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:
    - 1) Door Index: door number, heading number, and Architect's hardware set number.
    - 2) Quantity, type, style, function, size, and finish of each hardware item.
    - 3) Name and manufacturer of each item.
    - 4) Fastenings and other pertinent information.
    - 5) Location of each hardware set cross-referenced to indications on Drawings.
    - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for hardware.
    - 8) Door and frame sizes and materials.
    - 9) Degree of door swing and handing.
    - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
- 1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
  - 2. Provide Product Data:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

- a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
- b. Catalog pages for each product.
- c. Final approved hardware schedule edited to reflect conditions as installed.
- d. Final keying schedule
- e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
- f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

- 1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
  - a. Fire door assemblies, in compliance with NFPA 80.
  - b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

- 1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
- 2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
- 3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - a. For door hardware: DHI certified AHC or DHC.
  - b. Can provide installation and technical data to Architect and other related subcontractors.
  - c. Can inspect and verify components are in working order upon completion of installation.
  - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
- 4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

- 1. Fire-Rated Door Openings:
  - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.



- b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
  - 2. Smoke and Draft Control Door Assemblies:
    - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
  - 3. Electrified Door Hardware
    - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
  - 4. Accessibility Requirements:
    - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
  - 1. Keying Conference
    - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      - 2) Preliminary key system schematic diagram.
      - 3) Requirements for key control system.
      - 4) Requirements for access control.
      - 5) Address for delivery of keys.
  - 2. Pre-installation Conference
    - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Inspect and discuss preparatory work performed by other trades.
    - c. Inspect and discuss electrical roughing-in for electrified door hardware.
    - d. Review sequence of operation for each type of electrified door hardware.
    - e. Review required testing, inspecting, and certifying procedures.
    - f. Review questions or concerns related to proper installation and adjustment of door hardware.
  - 3. Electrified Hardware Coordination Conference:
    - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

#### 1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
  - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
  - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    - a. Mechanical Warranty
      - 1) Locks
        - a) Schlage L Series: 10 years
        - b) Schlage ND Series: 10 years
      - 2) Exit Devices
        - a) Von Duprin: 10 years
      - 3) Closers
        - a) LCN 4000 Series: 30 years
    - b. Electrical Warranty
      - 1) Locks
        - a) Schlage: 3 years
      - 2) Exit Devices

a) Von Duprin: 3 years

#### 1.08 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

#### 2.02 MATERIALS

- A. Fabrication
  - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
  - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

## 2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
  - a. Hager BB1191/1279 series
  - b. McKinney TB series
  - c. Stanley FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

## 2.04 CONTINUOUS HINGES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Select
  - b. ABH
  - c. Hager

### B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

## 2.05 ELECTRIC POWER TRANSFER

### A. Manufacturers:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin EPT-10

### B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.06 FLUSH BOLTS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood

- b. Trimco
- c. Hager

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage L9000 series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-3/5-inch x 3/5 inch with 180-degree visibility. Provide messages color-coded using ANSI Z535 Safety Red with full text and/or symbols, as scheduled, for easy visibility. When applicable allows for lock status indication on both sides of the door.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
  - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
  - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
  - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
  - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
  - e. Connections – provide quick-connect Molex system standard.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

## 2.08 CYLINDRICAL LOCKS – GRADE 1

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage ND series

### B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
  - a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
  - b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
  - c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
  - d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
  - e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

## 2.09 EXIT DEVICES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin 99/33A series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.

6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

## 2.10 POWER SUPPLIES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage/Von Duprin PS900 Series

### B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
  - a. 12/24 VDC Output, field selectable.
  - b. Class 2 Rated power limited output.
  - c. Universal 120-240 VAC input.
  - d. Low voltage DC, regulated and filtered.
  - e. Polarized connector for distribution boards.
  - f. Fused primary input.
  - g. AC input and DC output monitoring circuit w/LED indicators.
  - h. Cover mounted AC Input indication.
  - i. Tested and certified to meet UL294.
  - j. NEMA 1 enclosure.
  - k. Hinged cover w/lock down screws.
  - l. High voltage protective cover.

## 2.11 CYLINDERS



## 2.12 CYLINDERS

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage Everest 29 S

### B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. Patented Open: cylinder with permanent core with open keyway.
  - b. Patented Open: cylinder with interchangeable core with open keyway.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

## 2.13 KEYING

### A. Scheduled System:

1. New factory registered system:
  - a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

### B. Requirements:

- a. Replaceable Construction Cores.
  - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
    - a) 3 construction control keys
    - b) 12 construction change (day) keys.
  - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
  - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - 1) Master Keying system as directed by the Owner.
  - b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - c. Provide keys with the following features:
    - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
  - d. Identification:
    - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    - 2) Identification stamping provisions must be approved by the Architect and Owner.

- 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
  - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
  - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
- 1) Permanent Control Keys: 3.
  - 2) Master Keys: 6.
  - 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
  - 4) Key Blanks: Quantity as determined in the keying meeting.

## 2.14 KEY CONTROL SYSTEM

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Telkee
2. Acceptable Manufacturers:
  - a. HPC
  - b. Lund

### B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
  - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
  - b. Provide hinged-panel type cabinet for wall mounting.

## 2.15 DOOR CLOSERS

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. LCN 4040XP series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.

3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

## 2.16 DOOR TRIM

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood
  - c. Hager

### B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

## 2.17 PROTECTION PLATES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood
  - c. Hager

### B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

## 2.18 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. Rixson
  - b. Sargent
  - c. ABH

### B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

## 2.19 DOOR STOPS AND HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood
  - c. Hager

### B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

## 2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Zero International

2. Acceptable Manufacturers:
  - a. National Guard
  - b. Reese
  - c. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

## 2.21 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco
  - c. Hager

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

## 2.22 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
  - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
  - 1. Install construction cores to secure building and areas during construction period.
  - 2. Replace construction cores with permanent cores as indicated in keying section.
  - 3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
  2. Connections to and from power supplies to electrified hardware.
  3. Connections to fire/smoke alarm system and smoke evacuation system.
  4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  5. Connections to panel interface modules, controllers, and gateways.
  6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
- M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
  2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

HARDWARE GROUP NO. 001

FOR USE ON DOOR #(S):

126	149C	157B	202B	220	222
229					

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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-ALL HARDWARE BY OVERHEAD DOOR MANUFACTURER



HARDWARE GROUP NO. 103

FOR USE ON DOOR #(S):

107	108	113	114	115	116
117	121	122	123	134	221

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 105VW

FOR USE ON DOOR #(S):

201B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	630	IVE
1	EA	CORRIDOR LOCK	L9456T 06A	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	VIEWER	698	626	IVE

HARDWARE GROUP NO. 201

FOR USE ON DOOR #(S):

118B	140	203
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PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 201C

FOR USE ON DOOR #(S):

234

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 201CH

FOR USE ON DOOR #(S):

176

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 201H

FOR USE ON DOOR #(S):

109

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 205

FOR USE ON DOOR #(S):

238

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA DW + 4"	AA	ZER
1	EA	GASKETING	188S	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER

HARDWARE GROUP NO. 212N

FOR USE ON DOOR #(S):

135                      230

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 303S

FOR USE ON DOOR #(S):

137

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	OH STOP	90S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 341

FOR USE ON DOOR #(S):

111                    118A                    126A                    231

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 341C

FOR USE ON DOOR #(S):

146

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 343

FOR USE ON DOOR #(S):

213                    225

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 401

FOR USE ON DOOR #(S):

241

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 501

FOR USE ON DOOR #(S):

145 228

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 503

FOR USE ON DOOR #(S):

239 240

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 503N

FOR USE ON DOOR #(S):

119                      149B                      227                      232

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 512N

FOR USE ON DOOR #(S):

106

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 551CH

FOR USE ON DOOR #(S):

155

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	ND78TD RHO IS-CRS	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 551FH

FOR USE ON DOOR #(S):

136

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	ND78TD RHO IS-CRS	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 551H

FOR USE ON DOOR #(S):

102	128	129	130A	130B	132
133	142	143	144	151	152
154	201A				

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	ND78TD RHO IS-CRS	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 551HN

FOR USE ON DOOR #(S):

105A	141A	141B	149	156A
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PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	ND78TD RHO IS-CRS	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP HW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 700AHM

FOR USE ON DOOR #(S):

127

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L	626	VON
2	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
3	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

HARDWARE GROUP NO. 700CHM

FOR USE ON DOOR #(S):

200A

200B

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L	626	VON
2	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
3	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	SILENCER	SR64	GRY	IVE



HARDWARE GROUP NO. 700HM

FOR USE ON DOOR #(S):

209B                      209C

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L	626	VON
2	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
3	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 714AM

FOR USE ON DOOR #(S):

100A                      125B

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	99-DT	626	VON
1	EA	PANIC HARDWARE	99-NL	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	SET	PERIMETER GASKETING	BY ALUM FRAME MANUFACTURER		

HARDWARE GROUP NO. 781

FOR USE ON DOOR #(S):

139

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	99-L-NL-06	626	VON
2	EA	RIM CYLINDER	20-057 ICX	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 801

FOR USE ON DOOR #(S):

207                      210                      226

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16" F	630	IVE
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 801N

FOR USE ON DOOR #(S):

103                      104                      214

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16" F	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. C201

FOR USE ON DOOR #(S):

110A                      110B                      212A                      224

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIC LOCK	ND80TDEU RHO RX CON (FAIL SECURE)	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

HARDWARE GROUP NO. C201AC

FOR USE ON DOOR #(S):

124A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIC LOCK	ND80TDEU RHO RX CON (FAIL SECURE)	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

HARDWARE GROUP NO. C201AN

FOR USE ON DOOR #(S):

112

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIC LOCK	ND80TDEU RHO RX CON (FAIL SECURE)	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

HARDWARE GROUP NO. C205

FOR USE ON DOOR #(S):

105B                      202A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	114XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092T EU 06A RX CON (FAIL SECURE)	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

HARDWARE GROUP NO. C214

FOR USE ON DOOR #(S):

204

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	114XY	628	IVE
1	EA	CONT. HINGE	114XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	EU MORTISE LOCK	L9092T EU 06A RX CON (FAIL SECURE)	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	OH STOP	90S (INACTIVE)	630	GLY
1	EA	SURFACE CLOSER	4040XP SCUSH (ACTIVE)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

HARDWARE GROUP NO. C710ACM

FOR USE ON DOOR #(S):

125C                      126A

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	GASKETING	188S	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PANIC HARDWARE.

HARDWARE GROUP NO. C714AM

FOR USE ON DOOR #(S):

100B                      125A                      149A                      153A                      156B                      157A

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	SET	PERIMETER GASKETING	BY ALUM FRAME MANUFACTURER		
2	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PANIC HARDWARE.



HARDWARE GROUP NO. C714M

FOR USE ON DOOR #(S):

209A

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	114XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
2	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PANIC HARDWARE.

HARDWARE GROUP NO. C715

FOR USE ON DOOR #(S):

219

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	114XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PANIC HARDWARE.

HARDWARE GROUP NO. C715A

FOR USE ON DOOR #(S):

101A                      101C                      131A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	SET	PERIMETER GASKETING	BY ALUM FRAME MANUFACTURER		
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK		VON
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PANIC HARDWARE.

HARDWARE GROUP NO. C784

FOR USE ON DOOR #(S):

233

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	114XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-9947-EO	626	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-9947-L-M996-17-FSE (FAIL SECURE)	626	VON
1	EA	FSIC PERMANENT CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH (ACTIVE)	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	188S	BK	ZER
1	SET	MEETING STILE	328 (2 PCS - 1 SET)	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER
1	EA	WIRE HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	WIRE HARNESS (IN FRAME)	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.

-FREE EGRESS BY LEVER.

**END OF SECTION 08 71 00**

**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work Included: Furnish and install glass and glazing materials and accessories for both factory and field glazed assemblies specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples:
  - 1. Size: 305 mm by 305 mm (12 inches by 12 inches) of each type specified.
  - 2. Tinted glass.
  - 3. Reflective glass.
  - 4. Transparent (one way vision glass) mirrors.

**1.04 QUALITY ASSURANCE**

- A. Qualifications of Installers: Provide at least one person thoroughly trained and experienced in skills required, completely familiar with referenced standards and requirements of this work and to personally direct installation performed under this Section.
- B. Applicable Standards For Glass and Glazing Work: Conform to the "Manual of Glazing" of the Flat Glass Marketing Association, requirements of Federal Specification DD-G-451c and Safety Standard 16 CFR 1201 of the U.S. Consumer Products Safety Commission.
- C. Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.

## **1.05 APPLICABLE PUBLICATIONS**

- A. ANSI Z97.1-14: Safety Glazing Material Used in Building Safety Performance Specifications and Methods of Test.
- B. ASTM C1036-21: Standard Specification for Flat Glass
- C. ASTM C1048-12: Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
- D. Code of Federal Regulations (CFR): 16 CFR 1201-10 Safety Standard for Architectural Glazing Materials.
- E. International Building Code - Chapter 24: Glass and Glazing

## **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Protection: Protect glass and glazing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Storage and Protection: Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.
- C. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.01 GLASS TYPES**

- A. No manufacturer logos are allowed on any glass, except as required by governing codes and standards. Provide certification to General Contractor that tempered, heat strengthened, annealed, laminated, etc. glass was used where required.
- B. Annealed float glass shall comply with ASTM C1036, Type I, Class 1 (clear), Class 2 (tinted), Quality-Q3.
- C. Heat-Strengthened float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind HS.
- D. Tempered float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind FT.
- E. Heat-treated glass with elastomeric coating complying with ASTM C1048, Condition C (other coated glass), Type I (transparent glass, flat), Quality Q3 (glazing select) and with other requirements as specified.

- F. GANA/GTA 89-1-31, "Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Spandrel Glass with Applied Opacifiers", and with other requirements as specified.
- G. Provide type glass and thickness required and as follows:
  - 1. **Clear Annealed Float Glass:** 1/4" thick unless otherwise shown.
  - 2. **Clear Tempered Float Glass:** 1/4" thick unless otherwise shown. Conform to Safety Standard 16 CFR 1201 of the Consumer Products Safety Commission.
  - 3. **"Low-E" Coating:** Vitro Architectural Glass Solarban® 60 (2) Optigray® + Clear, VLT 50, SHGC 0.30, Insulating Glass Unit (IGU) or approved equal.

## 2.02 FIRE RATED GLASS

- A. Approved Manufacturers:
  - 1. PYRAN® Platinum L as manufactured by SCHOTT Technical Glass Solutions and distributed by SAFTI FIRST Fire Rated Glazing Solutions, 888-653-3333. Amber-tinted glass will not be accepted.
- B. Properties:
  - 1. Thickness: 3/8 inch overall
  - 2. Weight: 4 lbs./sq. ft.
  - 3. Appearance Must have neutral coloration free of amber tints.
  - 4. Fire-rating: 20 minutes to 3 hours for doors; 20 minutes to 60 minutes for other applications, with hose stream.
  - 5. Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II.
  - 6. STC Rating: Approximately 36 dB.
  - 7. Positive Pressure Test: UL 10C, UBC 7-2 and 7-4; passes.
- C. Labeling: Each piece of Fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory and fire rating.
- D. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 152 and ASTM E 163; NPFA 252 and NFPA 257; UL 9, UL 10B and UL 10C.
- E. Glazing Compound for Fire-rated Glazing Materials: Silicone Sealant, One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
  - 1. Dow Corning 795 - Dow Corning Corp.
  - 2. Silglaze-II 2800 - General Electric Co.
  - 3. Spectrem 2 - Tremco Inc.

- F. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- G. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

### 2.03 HERMETICALLY SEALED INSULATING GLASS ASSEMBLIES

- A. Manufacturer is used in this section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced standards.
  - 1. Guardian Industries
  - 2. Oldcastle Glass
  - 3. Pilkington
  - 4. Viracon Architectural Glass
  - 5. Vitro Architectural Glass
  - 6. Approved equal
- B. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. The following are assemblies comprised of the components listed above.
  - 1. **"Low-E" Coated Tinted/Tempered Assembly:** 1" thick panels consisting of 1/4" clear tempered float glass on interior and 1/4" thick tinted tempered float glass on exterior with 1/2" air space and coating on #2 surface.
  - 2. **"Low-E" Coated Tinted/Heat-Strengthened Assembly:** 1" thick panels consisting of 1/4" clear annealed float glass on interior and 1/4" thick tinted float glass on exterior with 1/2" air space and coating on #2 surface.
  - 5. **Clear/Tempered Assembly:** 1" thick panels consisting of 1/4" clear tempered float glass on interior and 1/4" thick clear tempered float glass on exterior with 1/2" air space.
  - 6. **Clear/Annealed Assembly:** 1" thick panels consisting of 1/4" clear annealed float glass on interior and 1/4" thick clear annealed float glass on exterior with 1/2" air space.
  - 7. **Spacers:** Aluminum in Black Finish. Verify color selection with architect before fabrication.

### 2.04 FLAT GLASS

- A. Flat Glass:
  - 1. Shall comply with ASTM C1036-21 Standard Specification for Flat Glass, Type 1, Class 1, (clear) or Class 2 (tinted, heat-absorbing and light-reducing) and Quality q3.
  - 2. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT (remove ASTM Standard C 1048 if annealed glass), Condition A (un-coated), B (spandrel glass, one surface coated), or C (other coated glass).
    - a. Heated Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.



- b. Maximum peak-to-valley rollerwave 0.003" in the central area and 0.008" within 10.5' of the leading and trailing edge.
- c. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or - 100mD (millidiopter) over 95% of the glass surface.
- d. Maximum bow and warp 1/32" per lineal foot.
- e. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
- f. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a 2 hour dwell at 290°C±10°C.

## **2.05 GLAZING ACCESSORIES**

- A. Provide glazing accessories required to complete glazing work that are compatible with various components of the glazing system(s), and subject to approval of Architect.
- B. Glazing Sealants: Provide Tremco "Proglaze", Bostik "Chem-Calk 2000", Pecora "836", Dow Corning Silicon 795, or approved equal. Color to be selected by Architect from manufacturer's standard line.
- C. Glazing Tapes: Provide Tremco "Pre-shimmed 440", Bostik "Chem Tape 60", Pecora "Shim-Seal", or approved equal. Color to be selected by Architect from manufacturer's standard line.
- D. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealants.
- E. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness and tested for compatibility with specified glazing sealants.
- F. Compressible Filler Rod: Closed-cell or waterproof jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.

## **PART 3 - EXECUTION**

### **3.01 GLASS SIZES**

- A. Measure sizes for glass from actual frames, doors and windows. Contract requires glass to be set in place, and Contractor assumes responsibility for correct sizes. Use sizes shown on Drawings for estimating only as approximate dimensions.

### **3.02 GLAZING SURFACES**

- A. Glaze only dry surfaces, free from dust or ice. Clean dirty surfaces with cloth saturated with turpentine or mineral spirits before glazing. Remove loose dirt particles and mortar from recesses prior to installation of glass and glazing materials.

### **3.03 SETTING GLASS**

- A. Set glass to provide equal bearing for entire width of each pane. Contractor responsible for broken glass due to improper setting. Set using glazing stops furnished by door or fixed framing manufacturer unless otherwise shown or specified. Accurately set glass to fit frame, with all edges smooth. Sharp ragged edges are not acceptable. Cushion glass in fixed interior view windows with felt strips around entire perimeter.

### **3.04 CLEANING GLASS**

- A. Contractor shall employ services of a professional window washer at completion of all work to wash glass which has been installed under this contract, removing all stains.
- B. Clean glass on both sides after painting operations are complete and dry. Do not use acid solutions or caustic soaps to clean glass.
- C. Do not use razor blades to clean glass. Any scratches on the glass caused by the cleaning process will be cause for the removal and replacement of the damaged glass at the Contractor's expense.

**END OF SECTION 08 80 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install glass and glazing materials and accessories for both factory and field glazed assemblies specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples:
  - 1. Size: 305 mm by 305 mm (12 inches by 12 inches) of each type specified.
  - 2. Tinted glass.

**1.04 QUALITY ASSURANCE**

- A. Qualifications of Installers: Provide at least one person thoroughly trained and experienced in skills required, completely familiar with referenced standards and requirements of this work and to personally direct installation performed under this Section.
- B. Applicable Standards For Glass and Glazing Work: Conform to the "Manual of Glazing" of the Flat Glass Marketing Association, requirements of Federal Specification DD-G-451c and Safety Standard 16 CFR 1201 of the U.S. Consumer Products Safety Commission.
- C. Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.

## **1.05 APPLICABLE PUBLICATIONS**

- A. ANSI Z97.1-2015: Safety Glazing Material Used in Building Safety Performance Specifications and Methods of Test.
- B. ASTM C1036-21: Standard Specification for Flat Glass.
- C. ASTM C1048-18: Standard Specification for Heat-Strengthened and Fully Tempered Glass.
- D. ASTM C1172-19: Standard Specification for Laminated Architectural Flat Glass.
- D. ASTM F1233-08
- E. Code of Federal Regulations (CFR): 16 CFR 1201-23 Safety Standard for Architectural Glazing Materials.
- F. International Building Code (2021) - Chapter 24: Glass and Glazing.
- G. NGA Publications: GANA Laminated Glazing Reference Manual, 2019 Edition.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Protection: Protect glass and glazing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Storage and Protection: Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.
- C. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

## **1.07 WARRANTY**

- A. Manufacturer's Special Warranty for Laminated Security Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated glass that deteriorates within specified warranty period. Deterioration is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation and delamination due to defects in material workmanship.
  - 1. Warranty Period: 10 years from date of Manufacture.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Approved Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
1. Kuraray America, Inc., Wilmington, DE 19803, 800-635-3182 (Basis-of-Design)
  2. Eastman Chemical Company, Kingsport, TN 37662, 800-327-8626.
  3. Global Security Glazing, Selma, AL, 866-412-6977. [www.security-glazing.com](http://www.security-glazing.com)

### **2.02 MATERIALS**

- A. Basis of Design: SentryGlas® 4.57mm thick interlayer by Kuraray America, Inc., 800-635-3182. Email: [trosifol@kuraray.com](mailto:trosifol@kuraray.com) Substitutions must provide third party test report indicating compliance with this testing criteria.
1. Saflex™ Storm VS-R with 4.68mm Interlayer Thickness by Eastman.
  2. CHILDGUARD®-2118 by Global Security Glazing, 866-412-6977.

### **2.03 GLASS TYPES**

- A. No manufacturer logos are allowed on any glass, except as required by governing codes and standards. Provide certification to General Contractor that tempered, heat strengthened, annealed, laminated, etc. glass was used where required.
- B. Annealed float glass shall comply with ASTM C1036, Type I, Class 1 (clear), Class 2 (tinted), Quality-Q3.
- C. Heat-Strengthened float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind HS.
- D. Tempered float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind FT.
- E. Heat-treated glass with elastomeric coating complying with ASTM C1048, Condition C (other coated glass), Type I (transparent glass, flat), Quality Q3 (glazing select) and with other requirements as specified.
- F. GANA/GTA 89-1-31, "Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Spandrel Glass with Applied Opacifiers", and with other requirements as specified.
- G. Reflective-Coated Vision Glass: ASTM C1376, Kind CV (coated vision glass), coated by pyrolytic process, and complying with other requirements specified

## 2.04 SECURITY GLAZING CATEGORIES

- A. Polycarbonate: Laminated or monolithic polycarbonate shall be extruded UV stabilized but when laminated uses various layers of urethane interlayers and thickness to achieve required performance levels. Polycarbonate laminates shall have a flexural strength of not less than 13,500 PSI: (ASTM D-790) 180 degrees F continuous service temperature. Products must conform to all applicable IBC building codes with a CC-1 flammability performance rating.
- B. Glass Clad Polycarbonate: Shall be laminated glass and polycarbonate construction using urethane interlayers and manufactured in accordance with ASTM C1349-10. All bullet-resistant glass clad products shall be "no spall" and listed with UL. Note bow and warp tolerances for non-symmetrical layups on larger sizes and required frame modifications.
- C. Insulated Glass Clad Polycarbonate: Shall be insulated using strengthened glass when needed to allow for heat build up in the air space, conforming to ASTM E2188, E2189 and E2190 for insulated glass units.

## 2.05 SECURITY GLAZING TYPES

- A. Low-E Insulated Security Glazing (Type LSG Low-E IGU): Single Source Insulating Glass with CHILDGARD® or approved equal Security Glazing by Certified Fabricator of Vitro Architectural Glass.
  - 1. Overall Unit Thickness: 1"
  - 2. Exterior Pane: 1/4" HS or FT glass, with Vitro Architectural Glass Solarban® 60 (2) Optigray® Low-E coating.
  - 3. Airspace: 3/8" Black LPD Spacer.
  - 4. Interior Pane: Clear Laminated Glass to be 1/8" + security interlayer + 1/8".
    - a. Forced Entry Resistance: ASTM F1233 Class 1.4 or better with ballistic weakening.
    - b. Forced Entry Resistance: 5-aa1 rated for a minimum of 5 minutes
    - c. Glass Color: Clear
  - 5. U-Factor: .31
  - 6. Solar Heat Gain Coefficient: .30
  - 7. Overall Visible Light Transmittance: .47
  - 8. Provide Certification for Fabrication by Certified Fabricator of Vitro Architectural Glass.
  - 9. Provide Test Report for ASTM F1233 Class 1.3 by Third Party Independent Laboratory.
  - 10. Provide Test Report for 5-aa1 by Third Party Independent Laboratory.
- C. Insulated Security Glazing Single Source Insulating Glass with CHILDGARD® or approved equal Security Glazing by Certified Fabricator of Guardian Glass
  - 1. Overall Unit Thickness: 1"
  - 2. Exterior Pane: 1/4" [ HS or FT ] glass, with Low-E coating on the No. 2 surface
  - 3. Airspace: 3/8" Black LPD Aluminum Spacer

4. Interior Pane: CHILDGARD® Security Glazing by Isoclima Specialty Glass, LLC or Global Security Glazing.
  - a. Forced Entry Resistance: ASTM F1233 Class 1.4
  - b. Forced Entry Resistance: 5-aa1 rated for a minimum of 6 minutes
  - c. Glass Color: Crystal Gray
5. U-Factor: TBD
6. Solar Heat Gain Coefficient: TBD
7. Shading Coefficient: TBD
8. Overall Visible Light Transmittance: TBD
9. Provide Certification for Fabrication by Vitro Architectural Glass
10. Provide Test Report for ASTM F1233 Class 1.4 by Third Party Independent Laboratory.
11. Provide Test Report for 5-aa1 by Third Party Independent Laboratory.

## **2.06 HERMETICALLY SEALED INSULATING GLASS ASSEMBLIES**

- A. Manufacturer is used in this section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced standards.
  1. Vitro Architectural Glass (Basis-of-Design).
  2. Approved equal
- B. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.

## **2.07 FLAT GLASS**

- A. Flat Glass:
  1. Shall comply with ASTM C1036-21 Standard Specification for Flat Glass, Type 1, Class 1, (clear) or Class 2 (tinted, heat-absorbing and light-reducing) and Quality q3.
  2. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT (remove ASTM Standard C 1048 if annealed glass), Condition A (un-coated), B (spandrel glass, one surface coated), or C (other coated glass).
    - a. Heated Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
    - b. Maximum peak-to-valley rollerwave 0.003" in the central area and 0.008" within 10.5' of the leading and trailing edge.
    - c. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or - 100mD (millidiopter) over 95% of the glass surface.
    - d. Maximum bow and warp 1/32" per lineal foot.
    - e. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
    - f. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a 2 hour dwell at 290°C±10°C.

## **2.08 GLAZING ACCESSORIES**

- A. Provide glazing accessories required to complete glazing work that are compatible with various components of the glazing system(s), and subject to approval of Architect.
- B. Glazing Sealants: Provide Tremco "Proglaze", Bostik "Chem-Calk 2000", Pecora "836", Dow Corning Silicon 795, or approved equal. Color to be selected by Architect from manufacturer's standard line.
- C. Glazing Tapes: Provide Tremco "Pre-shimmed 440", Bostik "Chem Tape 60", Pecora "Shim-Seal", or approved equal. Color to be selected by Architect from manufacturer's standard line.
- D. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealants.
- E. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness and tested for compatibility with specified glazing sealants.
- F. Compressible Filler Rod: Closed-cell or waterproof jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.

## **PART 3 - EXECUTION**

### **3.01 GLASS SIZES**

- A. Measure sizes for glass from actual frames, doors and windows. Contract requires glass to be set in place, and Contractor assumes responsibility for correct sizes. Use sizes shown on Drawings for estimating only as approximate dimensions.

### **3.02 GLAZING SURFACES**

- A. Glaze only dry surfaces, free from dust or ice. Clean dirty surfaces with cloth saturated with turpentine or mineral spirits before glazing. Remove loose dirt particles and mortar from recesses prior to installation of glass and glazing materials.

### **3.03 SETTING GLASS**

- A. Set glass to provide equal bearing for entire width of each pane. Contractor responsible for broken glass due to improper setting. Set using glazing stops furnished by door or fixed framing manufacturer unless otherwise shown or specified. Accurately set glass to fit frame, with all edges smooth. Sharp ragged edges are not acceptable. Cushion glass in fixed interior view windows with felt strips around entire perimeter.



### **3.04 CLEANING GLASS**

- A. Contractor shall employ services of a professional window washer at completion of all work to wash glass which has been installed under this contract, removing all stains.
- B. Clean glass on both sides after painting operations are complete and dry. Do not use acid solutions or caustic soaps to clean glass.
- C. Do not use razor blades to clean glass. Any scratches on the glass caused by the cleaning process will be cause for the removal and replacement of the damaged glass at the Contractor's expense.

**END OF SECTION 08 88 53**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Provide metal supports and fastenings, gypsum board, and related accessories specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Qualifications of Installers: Use only skilled and experienced gypsum drywall installers. Fully supervise at all times helpers and apprentices used for drywall work with thoroughly skilled gypsum drywall installers.
- B. Manufacturers' Recommendations: Manufacturers' recommended use of materials, fastenings, and methods of installation is basis for acceptance or rejection of drywall and cementitious backer units work where not specifically otherwise shown or detailed.

**1.05 REFERENCE STANDARDS**

- A. ASTM C475/C475M, Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM E580 - Suspension Systems in Areas Requiring Seismic Restraint.
- C. ASTM C1396/C1396M, Standard Specification for Gypsum Board.
- D. ASTM C36/C36M, Standard Specification for Gypsum Wallboard.
- E. ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.

- F. ASTM C1178, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- G. ASTM C1325, Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units. (Non-asbestos)
- H. ASTM C645, Standard Specification for Nonstructural Steel Framing Members.
- I. ASTM C754-04, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- J. Gypsum Association publications:
  - 1. GA-214-2021, "Levels of Finish for Gypsum Panel Products".
  - 2. GA-216-2021, "Application and Finishing of Gypsum Panel Products".
  - 3. GA-600, "Fire Resistance Design Manual".
  - 4. GA-800, "Materials Handling Manual".
  - 5. GA-234-2019, "Control Joints for Fire-Resistance Rated Systems"

#### **1.06 FIRE RESISTANCE RATINGS AND IDENTIFICATION**

- A. Where gypsum drywall systems with fire resistance ratings are indicated or are required to comply with governing regulations, provide materials and installation methods identical to applicable assemblies which have been tested and listed by recognized authorities, including Underwriters Laboratories, Warnock-Hersey and Factory Mutual.
- B. All joints in fire rated gypsum board construction are required to be taped and floated. This includes all joints in concealed and exposed partitions, ceilings and other applications where gypsum board is utilized as a fire barrier. All screws are to be floated over.
  - 1. Do not use self adhesive Tape at fire rated construction. Provide standard Tape and Drywall Mud.
- C. All rated partitions are to extend to the underside of the roof or floor deck above and are to be sealed at the point of intersection with the deck in accordance with requirements of Section 07 84 00 - Firestopping.

#### **1.07 PRODUCT HANDLING**

- A. Protection: Protect gypsum drywall materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

## PART 2 - PRODUCTS

### 2.01 GYPSUM MATERIALS

- A. **Manufacturers:** Use products and materials by one of the following manufacturers:
1. United States Gypsum
  2. National Gypsum Company
  3. Georgia-Pacific Company
  4. Temple-Inland, Inc.
  5. Certainteed
  6. James Hardie Building Products
  7. Approved Equal
- B. **Gypsum Wallboard:** Conform to ASTM C1396, have tapered edges and furnished in largest practical sheet size to minimize number of joints. Provide thickness as indicated on Drawings; typically provide 5/8" thickness at walls.
1. DPSAFT Construction Standards requires Gypsum Wallboard to meet ASTM C1396, Type X, 5/8-inch thick. Type X wallboard required at rated partitions.
  2. DPSAFT Construction Standards requires Gypsum Wallboard Sound Transmission Class minimum STC 41 in academic areas.
- C. **Backerboard for Ceramic Tile:**
1. Provide 5/8 inch DensShield® FireGuard® Tile Backer gypsum board as manufactured by Georgia Pacific Company, GlasRoc® Diamondback® Tile Backer by CertainTeed, or approved equal. Furnish largest size sheets practical to minimize joints. Conform to manufacturer's instructions for installation given the conditions detailed on the drawings. Caulk all joints where backer board comes into contact with dissimilar material.
  2. Provide 5/8 inch (interior) Durock® Brand Cement Board with EdgeGuard™ protection as manufactured by United States Gypsum Co., or approved equal. Furnish largest size sheets practical to minimize joints. Conform to manufacturer's instructions for installation of cement board given the conditions detailed on the drawings. Caulk all joints where backer board comes into contact with dissimilar material.
- D. **Fire Retardant Gypsum Board:** 5/8" fire retardant gypsum board conforming to UL Design Numbers listed on drawings for type and manufacturer.
- E. **Hi-Abuse Gypsum Board:** Provide National Gypsum "Hi-Abuse Brand Wallboard", 5/8" thick with abrasion resistant finish paper on face and heavy liner paper on back or approved equal. Provide fire rated units where required.
- F. **Impact-Resistant Gypsum Board:** Provide Certainteed "Extreme Impact Resistant Drywall" with enhanced mold and moisture protection, 5/8" thick with Abuse Resistant Face and Back Papers, and Impact Resistant Fiberglass Reinforcement on back. Meet ASTM C1629 and provide fire rated units where required. Attach to 20 gauge (33 mil) metal studs or thicker.

- G. **Mold & Moisture-Resistant Gypsum Panels:** Provide USG Sheetrock® Mold Tough® Panels where called out on the drawings. Comply with ASTM C1396. Provide fire rated units where required. Approved equal manufacturers:
1. CertainTeed ProRoc®
  2. Georgia-Pacific ToughRock® Mold-Guard Gypsum Board
  3. Gold Bond® Building Products eXP® Interior Extreme® Gypsum Board (1/2" thick) at non-fire rated wall and ceiling assemblies. Provide 5/8" thick Fire-Shield® at rated assemblies.
- H. **Finish:** In general, all gypsum board walls are to be taped and floated for a smooth finish. A slight egg-shell texture may be acceptable if approved by Architect prior to application. Heavy "knockdown" texturing is not acceptable.
1. All screw and/or nail heads are to be floated smooth both above and below ceiling line.
  2. Refer to Drywall Finishing Council document titled, "Recommended Specification For Preparation of Gypsum Board Surfaces Prior To Texture Application. When subjected to critical lighting, a Level 5 gypsum board finish as defined in GA-214-2021 ("Levels of Finish for Gypsum Panel Products") is recommended.
  3. For Levels 3, 4, and 5, job-site mock-up(s) shall be used to determine acceptance of the finish within the building. The design professional shall specify the mockup procedure and mock-up construction details within the project documents, unless waived in writing. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. **Use Level 4 finish for all finished areas open to public view.** Level 5 skim coating is required at areas exposed to severe lighting conditions, gloss, semi-gloss, or enamel paint applications. Refer to the drawings for specific area locations.

## 2.02 WALL AND PARTITION FRAMING

- A. Provide type, size, gauge and physical properties as described by the manufacturers load and height tables and in accordance with the current local building code. All section properties shall be calculated in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members (latest edition).
- B. Structural calculations specifically related to this project and performed by the manufacturer's structural engineer will indicate depths, gages and spacings of studs required to meet deflection and load bearing requirements.
- C. At all instances where radius steel stud and drywall construction is shown on drawings it is intended that the radius be smooth not faceted. Contractor is required to provide smooth face radius by whatever means necessary.
- D. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

- E. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.
  - 1. Screw attach blocking between studs for support of surface mounted items.
    - a. Plumbing fixtures.
    - b. Toilet partitions.
    - c. Wall cabinets.
    - d. Toilet accessories
    - e. Hardware.
    - f. Architectural woodwork.
    - g. Grab bars.
    - h. Handrails and railings.
    - i. Signage.
    - j. Other items requiring backing for attachment.

### **2.03 METAL FURRING MEMBERS**

- A. "Hat" Type Channels: ASTM C 645, 25 gage minimum, hat-shaped, depth and thickness as indicated. Provide 22 gage min. Galvalume® (GVM) Vented Hat Channel (HCV) at exterior rainscreen for spacing between insulation and exterior cladding.
- B. "C" Type Channels: 16 gauge, 1-1/2" deep cold rolled steel channels painted black and weighing not less than 475 lbs. per 1,000 LF.
- C. Z-Furring Members: Manufacturer's standard Z-shaped furring members with slotted or nonslotted web, fabricated from 26-gage galvanized steel, steel sheet complying with ASTM A 525 or ASTM A 568; with a minimum base metal (un-coated) thickness of 0.0179 inch, face flange of 1-1/4 inch, wall-attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.
- D. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (un-coated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

### **2.04 ACOUSTICAL INSULATION**

- A. In partitions, provide un-faced Owens-Corning Sound Attenuation Batt (SABs) Insulation, or approved equal, complying with ASTM C 665, Type I and ASTM E 136. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested complying with ASTM E 84.

### **2.05 DIRECT CEILING SUSPENSION SYSTEMS**

- A. Manufacturer: Chicago Metallic or approved equal.

1. Armstrong® Pre-Engineered FrameAll™ Drywall Grid.
- B. System: Provide Chicago Metallic Drywall Furring System(s) as follows:
  1. Typical System: 640-C or 660-C as recommended by manufacturer.
  2. Fire Rated System: Fire front 650-C or 670-C as recommended by manufacturer.
- C. Provide all runners, tees, cross channels, cross tees, wall track, hanger wire and accessories required for a complete installation.
- D. Where ceiling is subject to wind uplift, provide adequate bracing above ceiling to prevent uplift.

## **2.06 FASTENERS**

- A. Drywall Screws: Self-drilling type, 1" long for single layer application of gypsum board to metal studs and furring channels and of longer length for multiple layer installation.
- B. Powder-Actuated Fasteners: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Furring Anchorages: 16-gage galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws as recommended by furring manufacturer and complying with C754.

## **2.07 PROTECTIVE COATING**

- A. Galvanized steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

## **2.08 ACCESSORIES**

- A. Casing Bead: "Goldbond" No.500 galvanized steel by National Gypsum Co., or approved equal. Furnish and install metal reveal strips where shown and detailed.
- B. Corner Beads: 0.014 inch thick, hot dip galvanized steel with 1" flanges with 1/16" radius nose with large openings in flange similar to 5/8" diameter holes 7/8" on center.
- C. Control and Expansion Joints: "Sheetrock" zinc control joint No.093 by USG, or approved equal. Provide safin and/or acoustical insulation behind control joints as required for adjacent partition construction. Use fire rated control joints in partitions requiring a fire rating.



## 2.08 ACCESS PANELS AND FRAMES

- A. Manufacturer: Milcor Limited Partnership, 1150 North Cable Road, Lima, OH 45805, 1-800-528-1411, or approved equal.
- B. Ceiling Access Doors (in non-rated gypsum board ceilings): Provide Milcor style "DW", Model No. 3203-019, or approved equal. Provide 24" x 24" door size with screwdriver-operated, flush, cam-type locks. Furnish with factory prime coat.
- C. Wall Access: Provide 24" x 24" Model KDW Flush Access Door as manufactured by Karp Associates, Inc., 1-800-888-4212 or approved equal.
- D. **Access Locations:** Install removable access panels directly below each valve, flow indicator, damper, air splitter or other utility requiring access that is located above ceilings, other than at acoustical panel ceilings, and that would otherwise not be accessible. Install access doors and panels permitting access to service valves, traps, dampers, clean-outs, and other mechanical, electrical and conveyor control items concealed in walls and partitions. Verify types, fastening and locations with architect during shop drawing review submission.
  - 1. When possible, avoid locating access panels in wet areas. When such locations cannot be avoided, provide moisture resistant assemblies.
  - 2. Install fire-rated access doors in fire-rated partitions and ceilings in accordance with NFPA 80.

## 2.09 OTHER MATERIALS

- A. Provide materials, not specifically described but required for complete and proper installation of gypsum drywall, selected by Contractor subject to approval of Architect.

## PART 3 - EXECUTION

### 3.01 GENERAL PROVISIONS

- A. Comply with specified requirements, manufacturer's instructions and recommendations, and referenced standards.
- B. In cold weather, heat building to provide uniform temperature of 50° to 70° and provide ventilation to eliminate excess moisture.
- C. Deliver materials to job in original unopened containers or bundles and store protected from damage and exposure to the elements.
- D. Provide casing beads where edges of gypsum board meet dissimilar materials.
- E. Cooperate with carpenters in placing of backing and blocking required for millwork, fixtures, fittings, and accessories.

- F. Make cut-outs in panels for pipes, fixtures and small openings. Make holes and cut-outs by method that will not fracture wallboard core or tear covering. Cut holes with accuracy so plates, escutcheons and trim cover edges.
- G. Seal cut edges, holes, and areas where wallboard covering is broken, with resistant sealer.
- H. Install trim in strict accordance with manufacturers' recommendations. Install trim plumb, level, and true to line with firm attachment to supporting members.
- I. At any change in direction of gypsum board, provide sufficient auxiliary framing, blocking or nailers to allow secure attachment along every edge of every individual piece of gypsum board. Do not leave any loose edges.

### **3.02 INSTALLATION OF METAL SUPPORT SYSTEMS**

- A. Do not bridge building expansion joints with support system, frame both sides of joints with furring and other support as indicated.
- B. Ceiling Support Suspension System: Install in accordance with manufacturers recommendations.
- C. Wall/Partition Support System
  - 1. Install supplementary framing, blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported on gypsum board alone.
  - 2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
  - 3. Do not attach stud system to ductwork, piping, conduit, etc.
  - 4. Install runners (tracks) at floors, ceiling and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.
  - 5. Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support and substrate above the ceiling as indicated. Install angle bracing at 4'0" on center from ceiling runner to structure above.
  - 6. Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor slips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs. Install angle bracing above ceiling to structural in each direction at strike side of door. Double studs at all door openings.
  - 7. Provide runner tracks of same gage as jamb studs. Space jack studs same as partition studs.
  - 8. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads. Opening for duct work, piping must allow clearance for insulation, dampers, etc. Provide double 20 gauge studs at both sides of door openings less than 4'-0" wide and triple 20 gauge studs at door openings greater than 4'-0" wide.

9. Install wall/partition support system to maximum tolerances of 1/8" in 12'-0" measured horizontally and vertically.
10. At rated partitions, provide "5 sided" gypsum board enclosures where items (i.e. toilet accessories, electrical items, fire extinguisher cabinets, etc.) penetrate the surface of the wall, in order to maintain fire resistive integrity of the wall. Provide necessary related blocking.
  - a. "5 sided" enclosures may be omitted where metal electrical back-boxes not exceeding 16 square inches occur at one side only of a wall within a single stud cavity.
  - b. In this case, provide fire stopping material described in Section 07 84 00 to completely encompass the back box and its annular space.
  - c. If 5 sided gypsum board enclosures are not to be provided at any fire rated partitions, all provisions for installation of electrical boxes in rated partitions as described by Underwriters Laboratories shall be adhered to AND prior approval shall be given in written form by the Architect.
11. Provide "5 sided" enclosures similar to those described above at all penetrations into "sound" partitions and insulated exterior walls regardless of size. The provisions for the omission of the 5 sided enclosures at certain fire rated partitions do not apply to these sound and exterior partitions.

### **3.03 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS**

- A. Pre-Installation Conference: Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed.
- B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate course of board.
- D. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".
- E. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs. Do not butt boards to concrete floor. Maintain a minimum 1/4" to a maximum 3/8" space between bottom of board and concrete.
- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

- G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- H. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts. Space between recessed boxes and cut edges shall not exceed 1/8 inches.
- I. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories described below in article entitled "INSTALLATION OF DRYWALL TRIM ACCESSORIES".
- J. Cover both faces of partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase wall which are braced internally.
- K. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

### **3.04 INSTALLATION OF CEILING ACCESS PANELS**

- A. General Contractor is required to coordinate locations and number of access panels with affected trades in order to minimize the number of access panels required.
- B. Provide ceiling access panels in gypsum board ceilings as specified. Provide quantity required for access to the following items commonly found above the ceiling plain:
  1. Operable portion of fire, smoke and other dampers
  2. Valves and other operable portions of sprinkler system
  3. Valves to mechanical, domestic and other piping systems
  4. Mechanical devices
  5. Fire alarm devices
  6. Communication system devices and connection points
  7. Sanitary and storm sewer clean outs
  8. Also included are any other items located above an otherwise inaccessible ceiling that will require adjustment, maintenance, inspection, connection or replacement in whole or in part at any time after the initial installation of the item or the ceiling.

### **3.05 METHODS OF GYPSUM BOARD APPLICATION**

- A. On ceilings:
  1. Apply gypsum board prior to wall/partition board application to the greatest extend possible. For single-ply construction, use perpendicular application. For two-ply assembles use perpendicular application and apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

2. Where screws are used, they shall be spaced not more than 12 in. o.c. for ceilings where the framing members are 16 in. o.c..
  3. Screws shall be spaced not more than 12 in. o.c. for ceilings where framing members are 24 in. o.c..
  4. For applications on wood or other applications, refer to Gypsum Association GA-216 for fastener type and spacing.
- B. On partitions except shaft wall:
1. Use maximum length sheets practical to minimize end joints.
  2. When gypsum board is installed parallel to framing members, space fasteners 12 inches on center in field of the board, and 8 inches on center along edges.
  3. For applications on wood or other applications, refer to Gypsum Association GA-216 for fastener type and spacing.
  4. When gypsum board is installed perpendicular to framing members, space fasteners 12 inches on center in field and along edges.
  5. Stagger screws on abutting edges or ends.
  6. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
  7. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
  8. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- C. Wall Tile Base: Where drywall is base for thin set ceramic tile and similar rigid applied wall finishes, install gypsum backing board. At "wet" areas, install with un-cut long edge at bottom of work, and space 1/4" above fixture lips. Seal ends, cut-edges and penetrations of each piece with water resistant compound before installation.

### **3.06 INSTALLATION OF DRYWALL TRIM ACCESSORIES**

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install metal corner beads at external corners of drywall work. Corner beads are to be completely bedded and taped.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

- D. Install metal control joints where indicated on drawings. If not indicated on drawings, install in accordance with the following:
  - 1. Interior Partitions: Maximum Single Dimension not to exceed 20 feet. Maximum Single Area not to exceed 400 SF.
  - 2. Interior Ceiling With Perimeter Relief: Maximum Single Dimension not to exceed 40 feet. Maximum Single Area not to exceed 1,600 SF. Install control joint at any change of direction of ceiling framing or support system.
  - 3. Interior Ceiling Without Perimeter Relief: Maximum Single Dimension not to exceed 20 feet. Maximum Single Area not to exceed 400 SF. Install control joint at any change of direction of ceiling framing or support system.

### 3.07 JOINT TREATMENT

- A. General: Joint treatment for gypsum board surfaces is also described in Section 09 91 00 and may be performed under either the gypsum board or painting subcontract.
- B. All joints in gypsum board construction are to be taped and floated. This includes work above ceilings, at concealed places and anywhere else joints in gypsum board construction occur.**
- C. Base for Ceramic Tile: Treat joints and fasteners to comply with directions of water resistant joint compound manufacturer. In areas to be tiled treat fastener heads with water resistant joint compound. Fill tapered edges in gypsum panels with water resistant joint compound, embed joint tape firmly and wipe off excess compound; follow immediately with a second coat of water resistant joint compound over taping coat, being careful not to crown the joint. Fold and embed tape in all interior angles to form true angle.

### 3.08 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
  - 1. Gypsum board is fastened and held close to framing or furring.
  - 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the construction.

### 3.09 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including non-decorated surfaces.

- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction, where applicable.

### 3.09 INSTALLATION

- A. ASTM C840-08 or GA-216-2013 provides the following requirements for installing control joints in gypsum board assemblies:
  - 1. Section 20.2 (GA 4.7.1.1 & GA 4.7.2) – Control joints shall be installed where indicated on the plans. Full height door frames shall be considered equivalent to a control joint.
  - 2. Section 20.3 (GA 4.7.3) – Control joints in the gypsum board shall be specified by the architect or designer where any of the conditions described in 20.3.1-20.3.5 exist (GA 4.7.3.1 – 4.7.3.7).
  - 3. Section 20.3.1 (GA 4.7.3.1) – A control joint shall be installed where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the base building structure.
  - 4. Section 20.3.2 (GA 4.7.3.2) – Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
  - 5. Section 20.3.3 (GA 4.7.3.3) – Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft.
  - 6. Section 20.3.4 (GA 4.7.3.4) – Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
  - 7. Section 20.3.5 (GA 4.7.3.5) – Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
  - 8. Section 20.3.6 (GA 4.7.3.6) – A control joint or intermediate blocking shall be installed where ceiling framing members change direction.
  - 9. Section 20.3.7 (GA 4.7.3.7) – Control joints shall be installed where specified by the architect or designer as a design accent or architectural feature.
  - 10. Section 20.4 (GA 4.7.4) – Where a control joint occurs in an acoustical or fire-rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8 in. type X gypsum board, mineral fiber, or other tested equivalent.

### **3.10 CLEANING UP**

- A. Do not allow accumulation of scraps and debris arising from work of this Section. Maintain premises in neat and orderly condition at all times. Immediately remove spilled or splashed compound material and all trace of residue from adjoining surfaces.

**END OF SECTION 09 21 16**



**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.
  - 3. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
  - 1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 REFERENCED DOCUMENTS**

- A. ASTM Standards:
  - 1. A 641 - Standard Specification for Zinc-Coated (Galvanized ) Carbon Steel Wire
  - 2. A 653 - Specification for Sheet Steel Zinc coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
  - 3. B 69 - Specification for Roller Zinc.
  - 4. C 79 - Test Method for Gypsum Sheathing Board.
  - 5. E 84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 6. E 119 - Method for Fire Tests of Building Construction and Materials.
  - 7. A1011 - Standard Specification for Structural Steel.
  - 8. F1267 - Standard Specification for Metal, Expanded, Steel.
- B. Gypsum Association
  - 1. GA-253 - Application of Gypsum Sheathing
- C. Other Code Approvals and Performance Standards
  - 1. NAAMM EMMA 557-20 Standards for Expanded Metal.
  - 2. UL File Number R19331 Full list of ProSTUD, Spazzer, Resilient Channel, Sound Clip and Barrier Mesh UL design assemblies.

3. UL 2079-Fifth Edition. Provides joint protection for up to 1" with UL 2079 Class II or III Movement Capabilities at 80% compression. Use BlazeFrame® Perimeter L-Bead where Composite Firestop/Framing for use in fire-resistant joint systems in or between fire-resistance-rated walls and floor/ceiling or roof/ceiling assemblies (Fire, Smoke and Sound).

#### **1.04 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For engineered high-strength steel equivalent steel studs and tracks and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

#### **1.05 QUALITY ASSURANCE**

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with product-certification program of the Certified Steel Stud Association.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing and temperatures in excess of 90 deg. F. Store away from direct sunlight.

### **PART 2 - PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

## 2.02 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM A1003 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated. Galvannealed products are unacceptable.
- C. Studs and Tracks: ASTM C645. Use either conventional-thickness steel studs and tracks, engineered high-strength drywall steel studs and tracks.
  - 1. Steel Studs and Tracks:
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; or a comparable product by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) Telling Industries.
      - 3) Approved equal.
    - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection 0.0147 inch.
    - c. Depth: As indicated on Drawings.
  - 2. Engineered High-Strength Steel Equivalent Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C645 steel studs and tracks.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; ViperStud or a comparable product by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) Phillips Manufacturing Co.
      - 3) Telling Industries.
      - 4) Approved equal.
    - b. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements 0.0147 inch.
    - c. Depth: As indicated on Drawings.
  - 3. High performing Sound Wall Stud: Factory assembled 3-5/8", 4" or 6" sound isolating double stud using closed cell foam isolators creating sound dampening air gap. Use standard track.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; SoundGuard Stud by one of the following:
      - 1) Marino\WARE
      - 2) SCAFCO
    - b. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements.
    - c. Depth: As indicated on Drawings.

- D. Slip-Type Head Joints: Where indicated, provide [ one of ] the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement or as required by specific conditions.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Deflex (WSC) or a comparable product by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) Steel Network, Inc. (The).
      - 3) Approved equal.
  2. Single Long-Leg Track System: ASTM C645 top track with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
  3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
  4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; FAS Track, SLT Slotted Track or a comparable product by one of the following:
      - 1) BlazeFrame Industries.
      - 2) CEMCO; California Expanded Metal Products Co.
      - 3) ClarkDietrich Building Systems.
      - 4) Metal-Lite.
      - 5) Perfect Wall, Inc.
      - 6) Steel Network, Inc. (The).
      - 7) Telling Industries.
- E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; FAS Track or a comparable product by one of the following:
    - a. BlazeFrame Industries.
    - b. CEMCO; California Expanded Metal Products Co.
    - c. ClarkDietrich Building Systems.
    - d. Fire Trak Corp.
    - e. Metal-Lite.
    - f. Perfect Wall, Inc.
    - g. Steel Network, Inc. (The).
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Flat Strap or a comparable product by one of the following:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. Telling Industries.
  2. Minimum Base-Metal Thickness: 0.0296 inch.
- G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; CRC or a comparable product by one of the following:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. Telling Industries.
  2. Depth: 1-1/2 inches.
  3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Furring Channel or a comparable product by one of the following:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. Telling Industries.
    - c. Approved equal.
  2. Minimum Base-Metal Thickness: 0.0329 inch.
  3. Depth: As indicated on Drawings or 7/8 inch or 1-1/2 inches as required.
- I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; RC1 or RC-Max or a comparable product by one of the following as required:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. Telling Industries.
    - c. Approved equal.
  2. Configuration: Asymmetrical or hat shaped as required.
- J. Cold-Rolled Furring Channels: 0.058-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 3/4 inch or as required.
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
  3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Z Furring or a comparable product by one of the following:
  - a. CEMCO; California Expanded Metal Products Co.
  - b. Telling Industries.
  - c. Approved equal.

## 2.03 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
  1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 or ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
    - a. Uses: Securing hangers to structure.
    - b. Type: torque-controlled, adhesive anchor or as required.
    - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
    - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) or Group 2 (A4) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
  2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated or as required.
- E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538-inch and minimum 1/2-inch-wide flanges.
  1. Depth: As indicated on Drawings or 2-1/2 inches or 2 inches or 1-1/2 inches.
- F. Furring Channels (Furring Members):
  1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
  2. Steel Studs and Tracks: ASTM C645.
    - a. Minimum Base-Metal Thickness: 0.0329 inch or as required.
    - b. Depth: As indicated on Drawings.
  3. Engineered High-Strength Equivalent Gauge Steel Studs and Tracks: ASTM C645.
    - a. Minimum Base-Metal Thickness: 0.0147 inch or 0.0181 inch as required.
    - b. Depth: As indicated on Drawings.
  4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
    - a. Minimum Base-Metal Thickness: 0.0329 inch or as required.

5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
  - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong World Industries, Inc.
    - b. Chicago Metallic Corporation.
    - c. USG Corporation.

## **2.04 AUXILLARY SYSTEMS**

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
  1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), non-perforated.
  2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

- B. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### **3.03 INSTALLATION, GENERAL**

- A. Installation Standard: ASTM C754.
  - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
  - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
  - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
  - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### **3.04 INSTALLING FRAMED ASSEMBLIES**

- A. Install framing system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
  - 2. Multilayer Application: [As required by horizontal deflection performance requirements 16 inches (406 mm) o.c. or 24 inches (610 mm) o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: As required by horizontal deflection performance requirements 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.



- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
  - 6. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
  - 1. Screw to wood framing.
  - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Shaped Furring Members:
  - 1. Erect insulation, specified in Section 07 21 00-Thermal Insulation, vertically and hold in place with Z-shaped furring members spaced 24 inches dimension o.c. or as required.
  - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### **3.04 INSTALLING CEILING SUSPENSIONS**

- A. Install suspension system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c. or as required.
  2. Carrying Channels (Main Runners): 48 inches o.c.
  3. Furring Channels (Furring Members): 16 inches or 24 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION 09 22 16**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install tile specified on floors, and walls shown.
- B. Ceramic floor tile installed over concrete floor slabs using latex Portland cement mortar and latex Portland cement grout.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.
- B. Sealing of Joints: Section 07 92 00 - Joint Sealants.
- C. Metal and Resilient Edge Strips at Joints with New Resilient Flooring, and Carpeting: Section 09 65 19 - Resilient Tile Flooring and Section 09 68 13 - Tile Carpeting.
- D. Preformed expansion joints in tile flooring: Section 07 95 13 - Expansion Joint Cover Assemblies.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. ANSI A108 Installation Standards / A118 Material Specifications - American National Standard Specifications for the Installation of Ceramic Tile.
  - 1. ANSI A108.02 - Per Section 4.2.2 Substrate flatness for tiles 15 in. (0.38m) or longer: "For tiles with at least one edge 15 in. (0.38 m) or longer, the substrate shall have a maximum permissible variation of 1/8 in. in 10 ft. (3 mm in 3 m) from the required plane, and no more than 1/16 in. variation in 24 in. (2 mmm in 610 mm) when measured from the high points in the surface."
- B. ANSI A136.1 American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile.

- C. ANSI A137.1 American National Standard Specifications for Ceramic Tile – 2019, and A137.2 American National Standard Specification for Glass Tile – 2019
- D. ANSI A118.3 – Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy and Water-Cleanable Tile Setting Epoxy Adhesive.
- E. ANSI A118.4, Modified Dry-Set Cement Mortar.
- F. ANSI A118.6, Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- G. ANSI 118.7, American National Standard Specifications for High-performance Cement Grouts for Tile Installation.
- H. ANSI A118.12, American National Standard Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation.
- I. ANSI A118.13, American National Standard Specifications for Bonded Sound Reduction Membranes for Thin-set Ceramic Tile Installation.
- J. ANSI A118.15, American National Standard Specifications for Improved Modified Dry-Set Cement Mortar-2019.
- K. ANSI A326.3 American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials – 2017
- L. TCNA (HB) - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.
- M. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.
- N. ANSI A138.1, Green Squared–American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles, and Tile Installation Materials.
- O. Arkansas Division of Public School Academic Facilities & Transformation (DPSAFT) School Facilities Manual - Chapter 7: Building Systems 7150-2.
  - 1. Grout Tile using latex Portland cement grout. Exception: use chemical resistant epoxy grout in kitchens.

## **1.05 QUALITY ASSURANCE**

- A. Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

- B. Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
- C. Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.
  - 1. Installers to be from a company specializing in performing installation of products specified and have a minimum of three (3) years' experience.
- D. Before installing tile, erect mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Locate mock-ups on site in location and size as directed by Architect.
  - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 3. Obtain architect's acceptance of mock-ups before start of final unit of Work.
  - 4. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work. When directed, demolish and remove mock-ups from Project site.
- E. Install ceramic tile in accordance with recommendations contained in "Handbook for Ceramic Tile Installation" of the Tile Council of North America, Inc., latest edition.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If despite these precautions coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

#### **1.07 PROJECT CONDITIONS**

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at 50°F (10°C) or more in tiled areas during installation and for 7 days after completion unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

## 1.08 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed but a minimum of 12 pieces, for each type, composition, color, pattern, and size.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Tile:
    - a. Concept Surfaces **(Basis-of-Design)**
    - b. American Olean Tile Company, Inc.
    - c. Dal-Tile Corporation
    - d. Florida Tile
    - e. Approved Equal.
  - 2. Mortars and Grouts:
    - a. American Olean Tile Company, Inc.
    - b. Ardex Engineered Cements
    - c. Bostik, Inc.
    - d. C-Cure Chemical Co.
    - e. Custom Building Products
    - f. Laticrete International, Inc.
    - g. Litokol® S.p.A Epoxy Grout
    - h. Mapei Corporation

### 2.02 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile - 2012" for types, compositions, and grades of tile indicated. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Conform to ADA recommendations for slip resistance by providing minimum coefficient of sliding friction value of 0.42 DCOF AcuTest® for horizontal surfaces expected to be walked upon when wet.



- D Large Floor Tile Mortar: Provide Polymer-Enriched Thin-Set or Medium-Bed Mortar for a regular-setting, polymer-enriched (“modified”) mortar ideal for installing large- format tile on floors, and designed to bond and support large tile over a diverse range of floor substrates, interior and exterior. Can also be used to install small-format tile.
- E Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

### **2.03 TILE PRODUCTS**

- A Refer to Room Finish Schedule(s) and Product Schedule(s), and details on the drawings for types, colors, textures, patterns, size of Field Tile and Trim Shapes, and Color of Grout Specified, where applicable.

### **2.04 SETTING MATERIALS**

- A Thin-Set Applications at All Non-Wet Area Floors (TCNA F115): Latex-Portland Cement Mortar: ANSI A118.4, composition as follows: Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the manufacturer's standard dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
- B Thin-Set Applications at All Wet Area Floors and Upper Level Toilet Room Floors (TCNA F122): Latex-Portland Cement Mortar: ANSI A118.4, composition as follows: Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the manufacturer's standard dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
  - 1. Waterproofing: Laticrete 9235.
  - 2. Ardex Engineered Cements, 8+9
- C Thin-Set Applications at All Wet Area Walls (TCNA W244): Latex-Portland Cement Mortar: ANSI A118.4, composition as follows: Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the manufacturer's standard dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
  - 1. Waterproofing: Laticrete 9235.
  - 2. Ardex Engineered Cements, 8+9
- D Thin-Set Applications at All Non-Wet Area Walls (TCNA W243): Latex-Portland Cement Mortar: ANSI A118.4, composition as follows: Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the manufacturer's standard dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.

## 2.05 GROUTING MATERIALS

- A. Provide products to suit specific project requirements in accordance with TCA Handbook and ANSI A118.3 as follows.
1. Ardex Engineered Cements, WA
  2. Custom Building Products
  3. Laticrete SpectraLOCK PRO
  4. Mapei Corporation
- B. Minimum Grout Joint Size: The minimum allowable grout joint size will vary depending on the tile in use and how much one tile differs from another in size.
1. The actual grout size shall be at least three times the actual variation of facial dimensions of the tile supplied.
  2. Recommended: 3/16" grout joint at natural tile units and 1/8" at rectified tiles.
  3. Recommended at unglazed quarry tile: 3/8" chemical resistant epoxy (Kitchens).
- C. Offset Joint Patterns: Running bond/brick joint and any offset patterns utilizing tile where the side being offset is greater than 15", the offset pattern will be a maximum of 33% unless otherwise specified by the tile manufacturer.
1. If an offset greater than 33% is specified, design professional and owner must approve mock-up and lippage.
- D. Grout: Where indicated on the drawings, and elsewhere as required for filling the joints between tiles.
1. Polymer-Modified Portland Cement Grout:
    - a. Custom Building Products Polyblend Sanded Tile Grout; ANSI A118.6, for joints 1/8 – 1/2 inch (3 –13 mm) or approved equal.
    - b. Custom Building Products Polyblend Non-Sanded Tile Grout; ANSI A118.6 or joints up to 1/8 inch (3 mm) or approved equal.
    - c. Custom Building Products Prism® SureColor®Tile Grout, ANSI A118.7 for joints 1/8 – 1/2 inch (3 –13 mm) or approved equal.
  2. Dry-Set Grout:
    - a. Custom Building Products White Dry Tile Grout; ANSI A118.6, for joints up to 1/8 inch (3 mm) or approved equal. Note: Dry Tile Grout when gauged with Thin-Set Mortar Admix diluted with water 1:1 will yield a Latex Portland Cement Grout.
  3. Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy; ANSI A118.3:
    - a. Custom Building Products 100% Solids Epoxy Grout or approved equal. Available in all 48 Polyblend grout colors.
    - b. Custom Building Products CEG-Lite™ 100% Solids Commercial Epoxy Grout or approved equal.
- E. Elastomeric Joint Caulk: ANSI A108.01.3.7 Where indicated on the drawings, and elsewhere as required provide:
1. All joints between floors and walls and at joints between tile and dissimilar materials.

- a. Commercial 100% Silicone Caulk – ideal for movement joints in traffic areas
- F. Tile Grout: Where indicated on the drawings, and elsewhere as required for filling the joints between tiles. Where indicated on the Drawings, and elsewhere as required for grouting tile as specified by ANSI A108.10 Installation of Grout in tile work.
- 1. Polymer-Modified Portland Cement Grout:
    - a. Custom Building Products Polyblend® Sanded Tile Grout; ANSI A118.6, for joints 1/8 inch - 1/2 inch. Standard cement grout for wide joints.
    - b. Custom Building Products Polyblend® Non-Sanded Tile Grout; ANSI A118.6 or joints up to 1/8 inch. Standard cement grout for narrow joints.
    - c. Custom Building Products Prism® Consistent Color Tile Grout, ANSI A118.7 for joints 1/16 inch to 1/2 inch. Eliminates efflorescence and shade variation throughout tile assembly.
  - 2. Dry-Set Grout:
    - a. Custom Building Products Polyblend® White Dry Tile Grout; ANSI A118.6, for joints up to 1/8 inch.
  - 3. Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy; ANSI A118.3:
    - a. Custom Building Products CEG-Lite™ 100% Solids Commercial Epoxy Grout. Easy to clean up, non-sagging epoxy grout. Excellent stain and chemical resistance.
    - b. Custom Building Products CEG-IG 100% Solids Industrial Grade Epoxy Grout. Easy to clean up, non-sagging epoxy grout. Excellent stain and chemical resistance in heavy use areas.
    - c. Custom Building Products Fusion Pro™ Single Component Grout. Meeting the performance requirement of ANSI A118.3 and A118.7. No mixing required and is stain resistant.

## 2.06 MISCELLANEOUS MATERIALS

- A. Metal Edge Protection: Refer to drawings for size, types and finishes as manufactured by Schluter Systems, LP, 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. Tel: (800) 472-4588. Web: [www.schluter.com](http://www.schluter.com).
  - 1. Edge-Protection and Transition Profiles for Floors
  - 2. Finishing and edge-protection profiles for walls and countertops.
  - 3. Wall access panel system.
  - 4. Movement joint and cove-shaped profiles.
- B. Movement Joints-Vertical and Horizontal: In accordance with TCNA Method EJ171-18, to include but not be limited to the following:
  - 1. Construction Joint - EJ171A-18
  - 2. Contraction Joint - EJ171B-18
  - 3. Expansion Joint - EJ171C-18
  - 4. Isolation/Expansion Joint - EJ171D-18
  - 5. Expansion Joint, Cement Mortar, Bonded - EJ171E-18

6. Generic Movement Joint - EJ171F-18
  7. Perimeter Joint - EJ171G-18
  8. Expansion Joint, Cement Mortar, Cleavage Membrane - EJ171H-18
  9. Perimeter Joint - EJ171I-18
  10. Perimeter Movement Joint - EJ171J-18
  11. Movement Joint in Tile and Backerboard - EJ171K-18
  12. Generic Movement Joint with Backerboard - EJ171L-18
- C. Anti-Fracture Membrane/Cleavage Membrane: Where indicated on the Drawings, and elsewhere as required for isolating the installation from cracking due to minor substrate movement and normal structural deflections as specified in ANSI A108.17 and complying with ANSI A118.12, and TCNA F125-Partial-18 [ **and F125-Full-18** ] .
- D. Thin and Large Format Tile Leveling System (to prevent lippage):
1. Raimondi as supplied by Braxton-Bragg, 800-575-4401.
  2. Tuscan Leveling System™ by Pearl Abrasive Company, 100 West Burlington Avenue, Fairfield, Iowa 52556 USA. Phone: 1-312-212-3505.
  3. Unless otherwise noted on the drawings, provide for 1/8" wide grout joints.
- E. Provide other materials, not specifically described but required for complete and proper tile installation, selected by Contractor subject to approval of Architect.
- F. Provide epoxy coated system if Relative Humidity is over 80% with cementitious self-leveling underlayment to seal concrete. Install per manufacturer of epoxy moisture barrier as supplied by Laticrete, Mapei or approved equal product.

## **2.07 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
  2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.03 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.
- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
- F. **Movement Accommodation Joints:** Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.
  1. Locate joints in tile surfaces directly above joints in concrete substrates.
  2. Provide expansion and control joints at not more than 15 feet OC, at all expansion and control joints in the concrete subfloor and where otherwise recommended by the "Handbook for Ceramic Tile Installation" of the Tile Council of America.
  3. Movement joints shall be provided throughout the tile and work will conform to ANSI Specification A108.01-3.7; A108.02 – 4.4.and TCA Details EJ171.
  4. Allow for non-linear movement accommodation joints, which would not disrupt the flow of a pattern in a layout. Utilize crack-isolation membranes in accordance with TCNA Handbook method F125.

5. Seal all joints in accordance with requirements of Section 07 92 00.

### **3.04 INSTALLATION METHODS**

- A. Conform to TCA Handbook for installation on various substrates shown on drawings, using materials listed in Part 2 of this Specification Section.
- B. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### **3.05 CLEANING AND PROTECTION**

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  1. Remove grout residue from tile as soon as possible.
  2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, un-bonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.
  1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
  2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

**END OF SECTION 09 31 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install suspension systems, ceiling boards, panels and tiles, and accessories required for complete installation of acoustical ceilings specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 APPLICABLE STANDARDS**

- A. American Society for Testing and Materials:
  - 1. ASTM A641 - Specification for Steel Sheet, Zinc-Coated (galvanized) Carbon Steel Wire
  - 2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process
  - 3. ASTM C423 - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
  - 4. ASTM C635 - Standard Specification for Metal Suspension Systems for Acoustic Tile and Lay-in Panel Ceilings
  - 5. ASTM C636 - Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
  - 6. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials
  - 7. ASTM E119 - Fire Test of Building Construction and Materials
  - 8. ASTM E580 - Practice for Application of Ceiling Suspension Systems for Acoustic Tile and Lay-in Panels in Areas Requiring Seismic Restraint
  - 9. ASTM E1111 - Test Method for Measuring Interzone Attenuation of Ceiling Systems
  - 10. ASTM E1264 - Classification for Acoustic Ceiling Products
  - 11. ASTM E1414 - Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

12. CISCA (Ceilings & Interior Systems Construction Association) - Ceilings Systems Handbook

**1.05 LABEL REQUIREMENTS FOR RATED CEILINGS**

- A. Conform to requirements of Underwriters' Laboratories, Inc., UL Design numbers shown on the drawings for metal suspension systems, acoustical ceiling units and installation methods for rated ceiling assemblies. Furnish certificate signed by manufacturer's representative and ceiling system contractor to Owner. Certificate shall state that acoustical material was installed in accordance with manufacturer's recommendations and UL requirements.

**1.06 PRODUCT HANDLING**

- A. Protection: Protect suspended acoustical ceiling materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

**1.07 EXTRA MATERIALS**

- A. Deliver extra materials to Owner. Furnish extra materials, totaling 3% of the total installed, matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

**PART 2 - PRODUCTS**

**2.01 SUSPENSION SYSTEMS**

- A. Provide steel capped 15/16" exposed tee grid by one of the following:
1. Prelude® XL Armstrong World Industries
  2. USG Ceiling Solutions Donn® AX™/AXCE™ System
  3. CertainTeed EZ Stab Classic System
  4. Chicago Metallic® 200 Snap Grid™ (**Basis-of-Design**)
- B. Suspension Members: Intermediate type of sufficient strength and rigidity to carry acoustical ceiling units in true and level plane without exceeding 1/32" deflection in any 2 feet of their spans.
- C. Fabrication: Fabricate suspension system components from cold-rolled sheet steel conforming to ASTM A 366. Protect from rust and corrosion with hot dipped galvanized coating.
- D. Finish for Exposed Members: Factory applied, white, low-gloss, baked-enamel finish. Suspend main suspension system runners from overhead construction members with not less than 12 gauge galvanized steel wire conforming to Federal Specification QQ-W-461.



## **2.02 ACOUSTICAL TILE (NON-RATED)**

- A. Provide tile by Armstrong World Industries, USG Interiors, CertainTeed, Rockfon or equal units approved by Architect. Furnish units with Class 25 flame spread index set forth in Federal Specification SS-S-118b, Class III or Class 1 (0-25) as tested in accordance with ASTM E 84, 12" x 12" x 3/4" thick, beveled edge, non-directional fissured design. Furnish tile with factory applied white paint finish. Approximately 10% of tiles to be access tiles.

## **2.03 ACOUSTICAL CEILING BOARDS (NON-RATED)**

- A. **ACT-1:** 24" x 24" x 1", Education Premium™ Item No. 43200, Square Tegular Narrow (SLN), Smooth White Surface, by Rockfon® or approved equal product. Provide NRC 0.90 + CAC (NA).
- B. **ACT-2:** 24" x 24" x 3/4", Alaska® Item No. 10200, Square Tegular Narrow Lay-In (SLN), Smooth White Surface, by Rockfon® or approved equal product. Provide NRC 0.90 + AC 180.
- C. **ACT-3:** 24" x 24" x 3/4", Hygienic Plus™ Item No. 31100, Square Lay-In (SQ), Smooth White Surface, by Rockfon® or approved equal product. Provide NRC 0.90 + AC (NA).
- D. Furnish units rated non-combustible under the Flame Spread Index of Federal Specification SS-S-118b and having factory applied washable white surface finish.

## **2.04 OTHER MATERIALS**

- A. Provide materials, not specifically described but required for complete and proper installation of suspended acoustical ceilings, selected by Contractor subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 GENERAL INSTALLATION REQUIREMENTS**

- A. Examine surfaces and conditions affecting proper installation of acoustical materials. Do not proceed until unsatisfactory conditions are corrected.
- B. Do not start acoustical ceiling work until glazing is completed and exterior openings are enclosed.
- C. All wet work, including concrete and masonry work must be completed and dried out before work is started.
- D. Do not install acoustical materials unless uniform temperature in spaces where acoustical tile work is performed is at least 60° F. during and after installation.

- E. Install acoustical ceilings, complete, including component parts necessary to suspend systems from structure.
- F. Install suspension systems to permit border units of greatest possible size where not full size.
- G. Following installation, clean soiled and discolored surfaces. Remove and replace units damaged or improperly installed.
- H. For any units that do not have square edges and must be cut for any reason, install edge angle or "T" at same elevation as other supporting members and make a field cut in the same profile as the factory edge or splice in a factory edge. Paint cut edges or splice joints to match giving a visually flawless result.
  - 1. Refer to RevealCut™ Ceiling Tile-Cutting Workstations for 2' and 4' lengths as supplied by Arrow Fastener Company, (800) 776-2228.

**END OF SECTION 09 51 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install wood flooring at new gymnasium. Provide damp-proofing, ventilating base, and other accessories required for complete resilient wood floor system. Finish and mark floor as required and as specified.
- B. Related work specified under other sections. (A cross-reference should be incorporated in these sections.)
  - 1. Concrete and Concrete Finishing - Section 03 30 00.
    - a. Concrete Slab Depression: 2 1/8" using 25/32" flooring and subfloor.
    - b. Surface Finish: steel troweled and finished smooth.
    - c. Concrete Tolerance: +/- 1/8" in radius of 10'.
    - d. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
    - e. Compressive Strength: Concrete shall be a minimum of 3,000 psi and a maximum of 4000 psi compressive strength after 28 days. Concrete shall be free of washed river gravel, pea gravel, flint or hardener additives. No lightweight concrete.
    - f. High spots shall be ground level and low spots shall be filled in with approved leveling compound by the general contractor to meet the tolerance above.
  - 2. Dampproofing and Waterproofing - Section 07 10 00.
    - a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on the earth side of below grade walls by general contractor using suitable type membrane.
    - b. Sand-Poly-Sand slab construction is not an acceptable construction.
  - 3. Under Slab Vapor Barrier - Section 07 26 16.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Concrete Guidelines

1. Submit MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.
  2. Submit Robbins Technical Services "Concrete Guide Specification" for further information regarding conditions and requirements of concrete prior to installation.
- D. Maintenance Guidelines
1. Submit copy of Maintenance Instructions.

#### **1.04 QUALITY ASSURANCE**

- A. Floor System Manufacturer Qualifications
1. Basis of design shall be Eclipse floor system as provided by Robbins Sports Surfaces, [www.robbinsfloor.com](http://www.robbinsfloor.com), (800-543-1913).
  2. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years, Robbins, Inc. or an approved equal.
  3. Manufacturer will be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).
- B. Floor Contractor/Installer Qualifications and Certifications
1. The flooring contractor shall be a Robbins Accredited Installer with MFMA Accredited Installer(s) on-site for the duration of the wood floor installation; or, a contractor approved by Robbins Sports Surfaces.
  2. Flooring contractor shall submit a list of at least three completed projects of similar magnitude and complexity completed under current corporate identity.
- C. Floor System Design
1. The resilient padding provides consistent gradient resiliency. Assures uniform compression deflection transition from light loading to aggressive loading.
- D. Floor System Performance
1. Eclipse meets or exceeds criteria of the following performance criteria:
    - a. MFMA PUR
    - b. DIN 18032 Part2 2001
    - c. DIN 18032 Part2 1991
    - d. ASTM F2772 Sport Floor Standards
    - e. FIBA International Standards
    - f. EN 14904 Standards
  2. Independent testing report showing the system passing all criteria shall be provided as part of the bid qualification process and submittal process.

#### **1.05 REFERENCES**

- A. Designations:
1. MFMA - Maple Flooring Manufacturers Association
  2. MFMA PUR - Performance Uniformity Requirements
  3. DIN 108032 (part 2) 2001 - Performance Test
  4. DIN 108032 (part 2) 1991 - Performance Test
  5. ASTM F2772 - Athletic Performance Properties of Indoor Sports Floor Systems
  6. EN 14904 - European Committee for Standardization - Surfaces for Sports areas

7. ASTM F2772 - Athletic Performance Properties of Indoor Sports Floor Systems
8. FIBA - International Basketball Federation
9. FSC - Forest Stewardship Council
10. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
12. ASTM F710 - Practice for Preparing Concrete Floors. Concrete ph determination.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Materials
  1. Materials shall not be delivered, stored, or installed until all masonry, painting, plastering tile work, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained. In- Slab Relative Humidity shall be 85% or less using ASTM F 2170 In-Slab Relative Humidity test. Ideal installation/storage conditions are the same as those that will prevail when building is occupied
  2. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F 2170 In-Slab Relative Humidity test.

## **1.07 JOB CONDITIONS - SEQUENCING**

- A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.06.A are obtained.
- B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.
- D. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

## 1.08 WARRANTY

- A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
- B. Robbins, Inc. hereby warrants the Eclipse material to be free from manufacturing defects for a period of 1 year. This warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of Robbins. In the event of breach of any warranty, the liability of Robbins shall be limited to repairing or replacing Eclipse material and system components supplied by Robbins and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

## PART 2 - PRODUCTS

### 2.01 MATERIAL

- A. Vapor Barrier
  - 1. 6-mil polyethylene (above slab).
- B. Subfloor
  - 1. Robbins Eclipse subfloor panels with factory attached resilient pads.
- C. Maple Flooring Manufacturers Association (MFMA) Wood Flooring:
  - 1. 25/32" thick x 2-1/4" face width with 2 1/2" as acceptable option, 2nd & Better grade, Unfinished with Factory Sanded Advantage™ XL option as acceptable option, TGEM, KD Northern Hard MAPLE, Continuous Strip XLplus™. Flooring as manufactured by Robbins and graded in accordance with MFMA-FJ rules. Flooring will have XLplus™ technology to reduce or eliminate routine spacing for expansion.
    - a. Specie: Northern Hard Maple
    - b. Seasoning: Kiln Dried (KD)
    - c. Matching: Tongue and groove side-match and end-match. (TGEM)
    - d. Type: Finger-Jointed (FJ)
    - e. Pattern: Straight-lay (One directional)
      - 1) Options (delete or modify above):
        - a) Boston Square (Only available in unfinished 25/32" flooring thickness 2nd and better and 3rd and better grade)
    - f. Thickness: 25/32"
      - 1) Options (delete or modify above):
        - a) 33/32" (unfinished 2-1/4" face width only)

- g. Face Width: 2-1/4" face width with 2-1/2" as acceptable option
    - 1) Options (delete or modify above):
  - h. Grade: 2nd and Better
  - i. Expansion Option: XLplus™ Feature (Built-in expansion)
  - j. Surface Finish: Industry standard unfinished with Factory Sanded Advantage™ XL as acceptable option.
  - k. Certified Wood: Non FSC
    - 1. Treatment: None
- D. Fasteners
- 1. Flooring - 1-3/4" barbed cleats or staples.
  - 2. Subfloor - 1-5/8" to 1-3/4" subflooring nails or staples.
  - 3. Channel anchors - 1-1/2" long steel Powers SPIKE® anchors or Tapcons.
- E. Finishing materials
- 1. MFMA approved sealer
  - 2. MFMA approved finish
- F. Gamelines
- 1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.
- G. Perimeter
- 1. 3" x 4" ventilating type - Black.
- H. Fasteners
- 1. Flooring - 2" barbed cleats or staples.
  - 2. Subfloor - 1" coated staple of equivalent.
  - 3. Sleeper anchors - 2 1/2" Powers SPIKE® anchors and sleeves
- I. Finishing materials
- 1. MFMA approved oil-modified Sealer
  - 2. MFMA approved oil-modified Finish
- J. Gamelines
- 1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.
- K. Perimeter
- 1. 3" x 4" ventilating type - Black.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Inspect concrete slab for proper tolerance and dryness and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8" in 10'. Moisture content of the concrete slab shall not exceed 85% using ASTM F 2170 In-Slab Relative Humidity test.
- B. All work required to put the concrete subfloor in acceptable condition shall be the responsibility of the general contractor.
- C. Subfloor shall be broom cleaned by general contractor.
- D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

### **3.02 INSTALLATION**

- A. Vapor Barrier
  - 1. Install polyethylene with joints lapped a minimum of 6" and turned up 4" at the walls.
- B. Subfloor
  - 1. Position Eclipse subfloor panels per manufacturer's instructions, integrating top layer with adjacent panels. Allow for a 1/4" gap at subfloor panel end joints. Provide 1-1/2" to 2" expansion void at the perimeter and all vertical obstructions.
  - 2. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
  - 3. Install Bleacher Blocking per manufacturer's recommendations.
  - 4. Properly anchor subfloor panels at each factory designated location.
- C. Flooring
  - 1. Machine nail maple flooring along each edge of the Eclipse panel's upper layer, driving up all end joints and proper spacing provided for humidity conditions in specific regions. Consult your local Robbins "Certified" contractor. Provide 2" expansion voids at the perimeter and at all vertical obstructions.

### **3.03 FINISHING**

- A. Sanding
  - 1. Sand per manufacturer's recommendations.
  - 2. After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
  - 3. Inspect entire area of floor to ensure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
  - 4. Vacuum and/or tack floor before first coat of seal.



5. Floor should be clean and completely free of dirt and sanding dust.
- B. Finishing
1. Gymnasiums (delete if not applicable)
    - a. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer's instructions.
    - b. Buff and vacuum and/or tack between each coat after it dries.
    - c. Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.

### **3.04 WALL BASE INSTALLATION**

- A. Install vent cove base anchored to walls with base cement or screws. Use pre-molded outside corners and neatly mitered inside corner.

### **3.05 CLEANING**

- A. Clean up all unused materials and debris and remove it from the premises.

**END OF SECTION 09 64 66**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install resilient base and accessories specified. Clean and protect resilient components after installation.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.
- E. Installation and Maintenance Instructions: Submit manufacturer's published guide for Resilient Top-Set Wall Base.
- F. If required, submit the manufacturer's certification that the wall base has been tested by an independent laboratory and complies with the required fire tests.

**1.04 QUALITY ASSURANCE**

- A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is "qualified" if trained, or a certified by manufacturer or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver resilient base and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- C. Protect products from damage when handling and during construction operations.

## **1.06 PROJECT CONDITIONS**

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

## **1.07 EXTRA MATERIALS**

- A. Deliver to the Owner / Facility Manager maintenance stock, from the same manufactured lot as materials installed. Furnish 120 LF (one carton) for each color and type of wall base installed, and packaged with protective covering for storage and identified with labels clearly describing contents.

## **PART 2 - PRODUCTS**

### **2.01 RESILIENT WALL BASE**

- A. Manufacturer: Johnsonite, Inc., (800) 899-8916, 16910 Munn Road, Chagrin Falls, Ohio 44023. Web: [www.tarketna.com](http://www.tarketna.com) or approved equal.
  - 1. Mannington BurkeBase
  - 2. Roppe

- B. Furnish homogeneous 4" high, 1/8" thick, set-on type coved base in color(s) selected by Architect. Pre-molded corner units may be used at installer discretion if conditions warrant, but do not place where routine cleaning operations may cause corners to come loose.
1. Traditional Rubber Wall Base
    - a. Manufactured from a proprietary thermoplastic rubber formulation.
    - b. Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1.
    - c. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm<sup>2</sup> or greater, Class I.
    - d. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
    - e. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1 1/4" diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.
    - f. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.
    - g. Phthalate-free.
    - h. Contains at least 14% pre-consumer recycled content.
    - i. 100% Recyclable.

## **2.02 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation manufactured and warranted by a reputable manufacturer.
- B. Adhesives: as recommended by Johnsonite to meet site conditions.
1. Johnsonite 960™ Cove Base Adhesive or approved equal for cleaned and prepped porous surfaces. **DO NOT USE AT OUTSIDE CORNER INSTALLATIONS.**
  2. Johnsonite 946™ Premium Contact Adhesive or approved equal for cleaned and prepped non-porous surfaces such as stainless steel. **PREFERRED PRODUCT.**
    - a. Use at outside corners to ensure faster set-up, especially at short returns.
  3. ULTRASTIK™ All Purpose Tape which is double-sided, scrim-reinforced acrylic adhesive tape for applying base trim, as manufactured by Surface Shields.

## **2.03 OTHER MATERIALS**

- A. Provide materials, including adhesives, not specifically described but required for complete and proper installation of resilient flooring only as recommended by manufacturer of material to which it is applied and subject to approval of Architect.
- B. Covebase Groover recommendation: Model CB-060 as provided by D-Cut Products, Inc., for fabricating outside corners, (630) 916-9100 [www.dcutproducts.com](http://www.dcutproducts.com)

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion and aesthetics of resilient products.
  - 1. **Where existing base material has been removed at existing porous and non-porous wall surfaces, scrape or remove cured adhesives, contact cement or drywall joint compound so that there is a clean and smooth surface before installing new base material.**
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient wall base.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Vacuum clean substrates to be covered by resilient products immediately before installation.

### **3.03 RESILIENT BASE INSTALLATION**

- A. Comply with manufacturer's published instructions for installing resilient base. Refer to Installation Video: <https://www.youtube.com/watch?v=QCp2MunOCOY>  
For any installation questions call Johnsonite Technical Hotline: 800-899-8916.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths if practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

- F. Preformed corners: Install preformed Outside Corners where utilized before installing straight pieces.
- G. Field-Made or Job Formed Corners (recommendation):
  - 1. Outside and Inside Corners: Install pre-mitered corners first. Seat the bottom of the wall base snugly to the floor on either side of the corner. Anaerobic adhesive (Super Glue) may be used to adhere the two mitered pieces together. This can eliminate any slight gapping. Butt straight pieces of maximum lengths on either side of the pre-mitered corners. Make sure heights of the corner returns and the straight base match up.
  - 2. Outside corners: Form by bending without producing discoloration (whitening) at bends. DO NOT WHITTLE.
    - a. Fold base in half.
    - b. Make one continuous cut with a sharp cove base gouger or groover.
    - c. Shave both sides, starting halfway down and avoid cutting into original center cut.
    - d. Fold tightly; groove out remaining upper portion. Nip top then affix to wall with Johnsonite 946™ Premium Contact Adhesive.
  - 3. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

### **3.04 CLEANING AND PROTECTION**

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

**END OF SECTION 09 65 13**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install resilient flooring. Clean and protect resilient floor areas after installation.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings:
  - 1. Layout of patterns as shown on the construction documents.
  - 2. Edge strip locations showing types and detail cross sections.

**1.04 REFERENCES**

- A. ASTM Designations:
  - 1. ASTM E 492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine
  - 2. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
  - 3. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
  - 4. ASTM E 989 - Standard Classification for Determination of Impact Insulation Class (IIC)
  - 5. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
  - 6. ASTM F 141 - Standard Terminology Relating to Resilient Floor Coverings
  - 7. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
  - 8. ASTM F 1482 - Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
  - 9. ASTM F 1700 - Standard Specification for Solid Vinyl Floor Tile

10. ASTM F 1861 - Standard Specification for Resilient Wall Base
11. ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
12. ASTM F 2170-19a - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
13. ASTM F 2419 - Standard Practice for Installation of Thick Poured Gypsum Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring
14. ASTM F 2471 - Standard Practice for Installation of Thick Poured Lightweight Cellular Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring
15. ASTM F 2678 - Standard Practice for Preparing Panel Underlayments, Thick Poured Gypsum Concrete Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring
16. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

## 1.05 QUALITY ASSURANCE

- A. Obtain each type, color, and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Qualifications of Installers: Use only skilled and experienced resilient flooring installers for preparation of substrate and installation of flooring. Supervise helpers and apprentices at all times with thoroughly skilled resilient flooring installers.
- C. Manufacturers' Recommendations: Manufacturers' recommended methods of installation and the referenced applicable standards is basis for installation methods used on this work.
- D. Applicable Standards:
  1. Federal Specifications:
    - (a) SS-T-312B Tile, Floor: Asphalt, Rubber, Vinyl-Composition.
    - (b) SS-W-40A Wall Base: Rubber and Vinyl Plastic.
  2. Resilient Tile Institute:
    - (a) Recommended Installation Specifications for Vinyl Composition Tile Flooring and Asphalt Tile Flooring.
  3. Rubber Manufacturer's Association:
    - (a) Manual for the Preparation of Subfloors for the Installation of Solid Vinyl and Rubber Flooring.
    - (b) Specifications for Flexible Vinyl Cove Base.
    - (c) Specifications for Rubber Cover Base.
    - (d) Specifications for Solid Vinyl Flooring.
  4. Conform to ADA requirements for slip resistance by providing minimum coefficients of sliding friction of 0.6 COF for horizontal surfaces and 0.8 COF for ramps and other sloped surfaces.

- E. **Mockup:** Build floor tile mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Size: 100 sq. ft. for each type, color, and pattern. Locations as indicated on construction documents.
  - 2. Design Professional approved mockup may become part of the completed Project if undisturbed at time of Substantial Completion.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver flooring and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Store flooring materials on flat surfaces. Move flooring and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

#### **1.07 PROJECT CONDITIONS**

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install flooring until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during installation.

#### **1.08 SEQUENCING AND SCHEDULING**

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.
- B. Do not install flooring over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by flooring manufacturer's recommended bond and moisture test.

#### **1.09 EXTRA MATERIALS**

- A. Deliver extra materials to Owner. Furnish extra materials, totaling 3% of the total installed, matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

## **PART 2 - PRODUCTS**

### **2.01 LUXURY VINYL TILE**

- A. Refer to the Room Finish Schedule and Product Schedule on the drawings.
- B. Wet spread to be backing-specific manufacturer's adhesives for non-porous sub-floor. Provide Limited Commercial Warranty against excessive surface wear, static, delamination, edge ravel, zippering and backing resiliency loss.

### **2.02 INSTALLATION ACCESSORIES**

- A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated. Provide materials for filling cracks and leveling floor depressions by Mapei, or approved equal.
- C. Adhesives: Water-resistant type recommended by flooring manufacturer to suit resilient flooring products and substrate conditions indicated, if required.
  - 1. Provide HENRY® 695 premium, high-strength adhesive for the permanent installation of vinyl-backed flooring as both a wet-set and a pressure-sensitive adhesive, or approved equal.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of flooring, and in maximum available lengths to minimize running joints.
- E. Furnish beveled edge strips 1-1/8" wide where resilient flooring adjoins other floor finish of lower level.
- F. Provide Schluter®-DILEX-EKSB Series Surface Joint Profile transition strip in floor tile at all saw-cut or screed key joints in concrete, new or existing. Finish shall be stainless steel or color as selected by the design professional.

### **2.03 OTHER MATERIALS**

- A. Provide materials, including adhesives and moisture vapor barrier, not specifically described but required for complete and proper installation of resilient flooring only as recommended by manufacturer of material to which it is applied and subject to approval of Architect.
  - 1. ARDEX VB 100™ Fast-Track, One-Component Moisture Vapor Barrier or approved equal. Install per manufacturer published recommendations.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.
  - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
  - 4. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
  - 5. ASTM F710 - Practice for Preparing Concrete Floors. Concrete ph determination.

### **3.02 PREPARATION**

- A. Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by flooring immediately before installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

### **3.03 TILE FLOORING INSTALLATION**

- A. Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles in pattern as indicated on the drawings.
- D. Where demountable partitions and other items are indicated for installing on top of finished tile floor, install tile before these items are installed.
- E. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edging, thresholds, and nosing.
- F. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- H. Install 1-1/8" wide bullnose edging strips where edges of tile are exposed.
- I. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- J. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- K. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- L. Hand roll tiles where required by tile manufacturer.

### **3.04 CLEANING AND PROTECTION**

- A. Perform the following operations immediately after completing installation:
  - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by flooring manufacturers.
  - 2. Sweep or vacuum floor thoroughly.
  - 3. Do not wash floor until after time period recommended by resilient flooring manufacturer.

4. Damp-mop flooring to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.
1. Apply protective floor polish to flooring surfaces that are free from soil, visible adhesive, and surface blemishes.
  2. Use commercially available, metal, cross-linked acrylic product acceptable to flooring manufacturer.
  3. Coordinate selection of floor polish with Owner's maintenance service.
  4. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.
  5. Do not move heavy and sharp objects directly over flooring. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.
1. Strip protective floor polish that was applied after completing installation prior to cleaning.
  2. Reapply floor polish after cleaning.

**END OF SECTION 09 65 19**

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**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Furnish labor, materials, tools and equipment required and install decorative, seamless epoxy quartz flooring, cove base and walls specified.
- B. **\*\*\* BROADCASTING ALLOWED ONLY AT SHOWER FLOORS AND AREA BEYOND SHOWER ENCLOSURE(S)\*\*\*UNLESS OTHERWISE NOTED (UON)**

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Subcontractor Qualifications: Use installer approved and licensed representative of manufacturer of materials used. Use mechanics experienced in commercial installation of materials used and factory trained and qualified by manufacturer.
- B. Single Source Responsibility: Obtain each color, grade, finish, type, composition, and variety of flooring material from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Field Constructed Mock-up: Before installing flooring, erect mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Locate mock-ups on site in location and size as directed by Architect.
  - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 3. Obtain Architect's acceptance of mock-ups before start of final unit of Work.
  - 4. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.
  - 5. When directed, demolish and remove mock-ups from Project site.

- E. Pre-Installation Conference: Conduct conference at Project site as directed by Architect.

## **1.05 REFERENCES**

- A. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
- B. ANSI A326.3 Method For Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Material,

## **1.06 PROJECT CONDITIONS**

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Maintain temperatures at 50°F (10°C) or more during installation and for 7 days after completion, unless higher temperatures are required by manufacturer's instructions.
- C. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

## **1.07 WARRANTY**

- A. System manufacturer and system installer required to jointly warrant against bond failure, cracking, and deteriorations of seamless covering installed on structurally sound substrate for period of one year after acceptance of project and to replace, repair, or make good defective work or materials at Contractor's expense during warranty period.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Provide Seamless Floor Covering by the following manufacturers:
  - 1. TNEMEC Company, Inc., Eagle Rock Coatings, LLC, 501-448-2111.
  - 2. Desco™ Coatings, Inc., 800-426-4164.
  - 3. Terroxy® as supplied by Terrazzo & Marble Supply Companies, 800-762-7253.
  - 4. SIKA Epo-Rok® Industrial Flooring Systems, 800-933-7452.

### **2.02 MATERIALS**

- A. Seamless Epoxy Walls and Flooring: Provide Tnemec Series 223 Deco-Trowel®, Trowel Grade only, minimum 3/16" thickness;
  - 1. Provide integral cove base where indicated on Finish Schedule.
    - a. Provide 1/2" Deep x 1/8" Heavy Top Thickness Zinc "L" Cove Strip with continuous bead of silicone sealant or approved caulk at top.

2. Provide Tnemec Series 222 Deco-Tread® Multi-Purpose Epoxy Coating, double broadcast at 1/8" thick minimum. For use at shower floors and other floor areas subject to water and moisture build-up, providing slip-resistance.  
**BROADCASTING ALLOWED UNDER THESE CONDITIONS, UON.**

B. Minimum Performance Characteristics:

1. Impact Resistance: Gardner Impact Test. 160 in/lb - no cracking, chipping or delamination.
2. Indentation Resistance: MIL D 3134F, Section 4.74. Withstands 2,000 lbs/sq. in. for 30 minutes without indentation.
3. Tabor Abrasion Resistance: CS17 Wheels with 2,000 gm load for 10,000 cycles. 27.6 mg average loss per 1,000 cycles.
4. Toxicity: U.S. Department of Agriculture Research Service Meat Inspection Division, Non-Toxic.
5. Flammability: ASTM E-84 Tunnel Test. Flame Spread Classification (FSC) not to exceed 35.
6. Compressive Strength: ASTM C-579 - 10,400 psi.
7. Chemical Resistance: Unaffected by the following:

20% Hydrochloric Acid	10% Lactic Acid
Urine	Tea
Coffee	Mustard
Ethyl Alcohol	Mercurochrome
Iodine	Betadyne

C. **Slip Resistance Level:** Provide grit or anti-slip additive compatible with the floor coating system. Choices shall be between light, medium and heavy textures, depending on the needs of the specific area, to be approved by the architect.

1. 60 mesh aluminum oxide – Smaller grit size for a less aggressive texture
2. 30 mesh aluminum oxide – Larger grit size for a more aggressive texture
3. Different grades shall allow installers to create various levels of slip-inhibiting surface texture in accordance with facility and operational needs.

### 2.03 SHOWER APPLICATION

- A. Walls, cove and pan floor are to be applied integrally in same thickness throughout.
1. Provide Desco™ HydraBond Primer and System or equal system where required at slabs.
  2. Where top of wall application does not extend to ceiling, provide metal edge termination trim and apply clear silicone sealant to prevent moisture from getting behind wall substrate.

### 2.04 OTHER MATERIALS

- A. Provide materials not specifically described but required for complete and proper installation of seamless flooring of new, first quality of their respective kinds, in strict accordance with recommendations of manufacturer of flooring used, and subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and areas where flooring will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed flooring.
  - 1. Verify that substrates are firm, dry, clean, and free from oil or waxy films and curing compounds.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind flooring has been completed before installing flooring.
  - 3. Notify the Architect of any cracks or irregularities in the substrate that might telegraph through the flooring or cause it to crack.
  - 4. Installer must examine substrates for moisture content and other conditions under which flooring is installed, and notify Contractor in writing of conditions detrimental to proper completion of this work. Do not proceed until unsatisfactory conditions are corrected.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. General: Prepare substrate surfaces including etching of concrete floors, application of sealer or primer coats and preparation required to obtain optimum adhesion to surfaces, to seal surfaces against migration of foreign materials through coating, and to provide for smooth, uniform finished surface.
- B. Patch all depressions, divots, honeycombed or scaled concrete with filler as recommended by manufacturer.
- C. Fill all non-moving cracks or control joints with joint filler as recommended by manufacturer.
- D. Fill all moving cracks or joints with a firm but flexible sealant material as recommended by manufacturer. Control joints should be re-cut in finished floor if required and filled with sealants.
- E. Mask surfaces that require protection.

### **3.03 INSTALLATION**

- A. Apply flooring in accordance with manufacturer's printed instructions, employing lead mechanic qualified under the quality assurance portion of this specification, using equipment specifically designed for this purpose.

- B. Surfacing shall be tightly compacted, trowel applied. Trowel apply vertical cove base and hand sand cove base. Apply three coats of resin to assure a smooth surface and cove. Do not allow resin to puddle in cove.
- C. Finished work shall match approved samples; be uniform in thickness, sheen, color, pattern, and texture; and be free from defects detrimental to performance.
- D. CMU substrate shall be clean and dry so installer can prime and prepare before troweled-on product is applied. Painter is NOT to apply any block filler at areas designated to receive TNEMEC product.

#### **3.04 PROTECTION**

- A. During work under this Section protect surfaces of other trades against damage. After installation allow no traffic on seamless covering for at least 72 hours. Protect completed flooring from damage until final acceptance of project by Owner.

**END OF SECTION 09 67 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Furnish and install specified tile carpeting, including accessories required for complete and proper installation. Clean and protect installed carpet tiles.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM F1869-16a - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ASTM F710-19e1 - Practice for Preparing Concrete Floors. Concrete ph determination.
- D. ASTM F2170-19a - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.

**1.05 QUALITY ASSURANCE**

- A. Qualifications of Installers: Use only thoroughly trained and experienced carpet installers completely familiar with materials specified, manufacturer's recommended methods of installation, and requirements of this work.
- B. Manufacturer's Recommendations: Manufacturer's recommended methods of installation is basis for methods of installation used in this work.
- C. Applicable Standards: Meet OSHA requirements and flammability requirements of DOC-FF-1-70.

- D. **Pre-installation Meeting:** Conduct the meeting at work site with installers of other work adjoining carpeting including resilient base and representatives of other entities directly concerned with performance of carpet, including Port and product manufacturers.
1. Review contract documents, submittals, status of coordinating work, proposed installation schedule, and procedures.
  2. Review laydown area and logistics.
  3. Review ambient conditions and ventilation procedures.
  4. All related submittals shall be approved prior to the pre-installation meeting.
  5. Discuss carpet protection requirements for the duration of construction.
- E. **Mock-ups:** Install 10 x 10 foot minimum mockup to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Architect approved mock-ups may become part of the completed project if undisturbed at the time of Substantial Completion.

## 1.06 JOB CONDITIONS

- A. **Environmental Conditions:** Maintain temperatures in space in accordance with carpet or adhesive manufacturer's recommendations, but in no case less than 65 degrees F for 24 hours prior to, during and after installation. Sub-floor temperature should be a minimum 65 degrees F for 24 hours prior to and after installation.
- B. **Precondition:** All of the carpet shall be spread in a room on site 24 hours prior to actual installation with the room preconditioned at a minimum of 65 degrees F with humidity between 10% to 65%.
- C. **Moisture:** A calcium chloride test should be performed on the concrete to detect the presence of moisture. Acceptable results require that moisture content does not exceed 3 lbs. per 1,000 square feet per 24 hours. One calcium chloride test should be performed for every 300 yards of carpet. Relative Humidity ASTM-F-2170 test method maybe be used in place of calcium chloride test. Acceptable moisture levels are 75% maximum relative humidity. Alkalinity tests must also be performed. PH should register between 5 and 9. All test should be documented and results saved.

## 1.07 EXTRA (ATTIC) STOCK

- A. **General:** Furnish 5% additional yardage of each carpet type required; extra yardage is over and above any overage provided by manufacturer. Normal manufacturing overage not to exceed 10% for under 1000 yards, not to exceed 5% for over 1000 yards. Deliver to the Owner uncut in clearly marked dust-proof packages prior to commencement of work; store where directed.

## 1.08 WARRANTY

- A. **Warranty for Carpet:** Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation which fail in materials or workmanship within specified warranty period.



1. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, lack of color retention, poor wear, and staining, change in texture, and delamination.
2. There shall be no limitations to:
  - a. Full warranty coverage due to age of carpet or other deductive warranty considerations or pro-rations.
  - b. Duration of adhesive cure time received prior to use of the carpeted area.
3. Warranty period shall be manufacturer's standard warranty period or 10 years from date of substantial completion, whichever is greater.

## **PART 2 - PRODUCTS**

### **2.01 TILE CARPETING**

- A. Provide from one of the following manufacturers:
  1. Mannington
  2. Milliken & Company
  3. Mohawk
  4. Patcraft
  5. ShawContract
  6. Tarkett
- B. Refer to Product Schedule on the Drawings for types, sizes, colors and patterns.

### **2.03 ACCESSORIES**

- A. Edge Guard and/or Transition Strip: Roberts Consolidated Industries or approved equal, edge guards and transition strips of types, sizes and profiles required. Submit color choices to Architect for selection of finish color.
- B. Installation Adhesive: Water-resistant type recommended by manufacturer, and complying with flammability requirements for installed carpet, where required.
  1. Provide HENRY® 650 R Pressure Sensitive Adhesive with releasable or permanent bonding properties or approved equal, if required. Moisture resistant up to 90% RH, solvent free and nonflammable.
- C. Seaming Cement: Hot melt seaming adhesive or similar product recommended by manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

### **2.03 OTHER MATERIALS**

- A. Provide materials not specifically described but required for complete and proper carpet installation of new, first quality of their respective kinds recommended by manufacturer of carpeting, and subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 MEASUREMENTS**

- A. Dimensions for carpet tile areas are approximate. Carefully check dimensions and other conditions affecting this work in the field. Contractor responsible for proper installation in areas designated.

### **3.02 PRE-INSTALLATION REQUIREMENTS**

- A. Installer must examine substrates for moisture content and other conditions under which carpet tile is installed, and notify Contractor in writing of conditions detrimental to proper completion of this work. Do not proceed until unsatisfactory conditions are corrected.
  - 1. Floor preparation shall be free of cracks and holes. Gaps of 1/16" or more are to be filled with latex base flashing compound.
  - 2. Floor temperature should be at 65° at least 24 hours prior to installation and 48 hours after carpet is installed.
- B. Clear debris and scrape up cementitious deposits from surfaces to receive carpet tile. Vacuum clean immediately before installation. Check concrete surfaces to ensure no "dusting" results through installed carpet. Apply sealer when required to prevent dusting.
- C. Sequence carpet tile installation with other work to minimize possibility of damaging and soiling carpet tile during remainder of construction period.

### **3.03 INSTALLATION OF CARPET TILE**

- A. Comply with manufacturers' instructions and recommendations. At doors, center seams under doors. Do not place seams in traffic direction at doorways.
- B. Cement seams in accordance with manufacturer's instructions to produce best possible even top pile and prevent sprouting of face yarn and backing.
- C. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet tile edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform bond. Remove excess adhesive promptly from face of carpet tile.

### **3.04 ROOM/AREA MOCKUPS**

- A. After the building is enclosed to provide weather protection, complete one typical full-size mockup of the following rooms and spaces:
  - 1. One of each room type or area, minimum 100 SF, as determined by the design professional.
- B. Mockup components shall be full size, using the same materials as those to be used in the actual Work, including details and methods of construction.

- C. Interior Room/Area Mockup: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- D. Fabricate and erect each mockup under manufacturer's / installer's direct supervision and employ same installers as they would be employed during the actual performance of the Work at the job site. Employ same supervisory personnel who will perform site erection.

### **3.05 PROTECTION AND CLEANING OF CARPET TILE**

- A. Adequately cover and protect against damage during shipment and delivery to job site, and until acceptance by Owner.
- B. Protect during installation using drop cloths, or heavy, reinforced, non-staining Kraft paper.
- C. Damaged carpet tile will be rejected and replaced by Contractor.
- D. At completion of work and when directed by Owner, vacuum clean carpet tile and remove soiling.
- E. Install plybar or 6 mil. visqueen protection over areas of carpet tile. Lap 12" at edges. Continuously tape down edges and joints.

### **3.06 MAINTENANCE**

- A. Submit 2 copies of complete manual of manufacturer's maintenance recommendations.

### **3.07 EXTRA (ATTIC) STOCK**

- A. Attic Stock: Furnish 5 percent of job required yardage of carpet tile.

**END OF SECTION 09 68 13**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Provide acoustical wall panels specified. Refer to drawings for sizes, types and locations.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Furnish at least one person, present at all times, thoroughly familiar with installation requirements of each item, to personally supervise installation.

**1.05 PRODUCT HANDLING**

- A. Protect wall panels before, during, and after installation. Protect installed work and materials of other trades.
- B. In event of damage, immediately make repairs and replacements at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 SOUND-ABSORPTIVE PANELS**

- A. **Manufacturer:** Pinta Acoustic, Inc., 2601 49<sup>th</sup> Avenue North, Suite 400, Minneapolis, MN 55430, 1-800-862-0032 or approved equal. [www.pinta-acoustic.com](http://www.pinta-acoustic.com)
- B. **Suspended Panel:** SONEX® PLANO Absorbers made with WILLTEC™ foam in natural white or light grey. Custom profile shapes available as indicated on the drawings. Length up to 48" and Depth: 24 to 32 inches. Standard thickness is 2". Install per manufacturer's Slide T-rail into groove on top of the baffle. Clip into standard 15/16" T-grid.

1. Baffles may also be flush mounted to a ceiling or structure using C-channel. Install per published recommendations.
  2. Corkscrew Hangars: A most common method of hanging Pinta acoustic products, which comes in several different types and sizes. Consult Pinta Engineering for proper method, whether in a 3" x 48" x 96" cloud or 2" x 96" baffle, usually with provided cable hanger kits.
  3. Note: Pinta Acoustic products cannot be field painted. Back of Main-T will be bare aluminum (silver) and shall be painted black or color to match the baffle.
- C. **Direct-Attached Wall and Ceiling Panels:** Attach with PA-04 AcouSTIC Adhesive or approved equal product on the back of WILLTEC™ Panel, 2" thick. Press panel directly to wall or ceiling. (Shape up to 48" x 96" per piece).
- D. **WILLTEC™ Flat Sheet Material:**
1. Made from smooth, natural light grey or white open cell, expanded melamine foam.
  2. Square-cut 90- or 15-, 22.5-, 30- and 45-degree bevel edge options.
  3. Standard water-based acoustic coating in white, light, medium or dark greys, black and other premium and custom color options.
  4. Panel Sizes: various square and rectangular shapes up to 48 x 96 inches (1219 to 2438 mm) as well as circular, triangular, trapezoidal and custom.
  5. Various Thicknesses: 1 to 4 inches (25 to 102 mm) and custom.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Prior to installation, verify items may be installed in accordance with manufacturers' recommendations.
- B. Notify Architect of conditions that would adversely affect installation.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install wall panels in strict accordance with manufacturers' current recommendations and instructions.

### **3.03 ADJUSTMENT AND CLEANING**

- A. Verify that trim is in place and adjust components.
- B. Remove labels and packing materials from job site.

**END OF SECTION 09 84 00**

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**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work Included: Provide specified painting and finishing of interior and exterior items.
1. Provide painting of all new exposed steel and iron work, including primed metal surfaces. Paint exposed-to-view pre-finished metal surfaces of items, if required. Refer to drawings for existing metal to be painted.
  2. Provide touch-up of pre-finished items to match original finish.
  3. **Do not paint** waterproof coatings, water repellent coating, acoustical ceilings, toilet partitions, aluminum with factory applied finish, or pre-finished items, except as noted above.
  4. **Do not paint** over any code required metal labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. Mask off the label before applying finish and remove masking after finish is dry.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 DEFINITIONS**

- A. Term "paint", as used herein, includes enamels, paints, sealers, fillers, emulsions, varnishes, stains, and other coatings whether used as prime, intermediate, or finish coats.

**1.05 QUALITY ASSURANCE**

- A. Qualifications of Painters: Use only qualified journeyman painters for mixing and application of paint. In acceptance or rejection of painting, no allowance made for lack of skill on part of painters.
- B. Mockups - Interior: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
  - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 SF.
  - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
  - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## **1.06 PRODUCT HANDLING**

- A. Delivery: Deliver paint materials to job site in original unopened containers with labels intact and legible at time of use.
- B. Protection:
  1. Store only approved materials at job site and store only in suitable and designated area restricted to storage of paint materials and related equipment.
  2. Ensure safe storage and use of paint materials and prompt and safe disposal of waste.
  3. Protect paint materials before, during, and after application and protect installed work and materials of other trades.

## **PART 2 - PRODUCTS**

### **2.01 PAINT MATERIALS**

- A. Manufacturers: Provide paints, enamels, stains, varnishes, and admixtures of first line quality by Sherwin Williams or approved equal. Sherwin Williams products specified herein establish minimum quality standards. Approved equal products:
  1. Farrell-Calhoun
  2. PPG Paints
  3. Benjamin Moore
- B. Compatibility:
  1. Paint materials and equipment to be compatible. Finish coats compatible with prime coats, prime coats compatible with surface to be coated, and tools and equipment compatible with coating applied.
  2. Thinners (when used): Use thinners recommended for that purpose by manufacturer of material thinned.



## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS

- A. Inspection: Carefully inspect installed work of other trades and verify work is complete to point where painting work may properly commence. Verify paint finishes may be applied in strict accordance with manufacturer's directions and requirements of these Specifications.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.

### 3.02 PREPARATION OF SURFACES

- A. Protection: Completely mask, remove, and adequately protect hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces not scheduled to receive paint.
- B. Priming: Use primer recommended by manufacturer of coating system. Spot prime exposed nails and metals to be painted with emulsion paints.
- C. Cleaning: Thoroughly clean surfaces receiving paint. Schedule cleaning and painting so dust and contaminants from cleaning process will not fall on wet, newly painted surfaces.
- D. Gypsum Board: Treat and conceal joints, screw heads, and depressions in gypsum board surface in accordance with manufacturer's recommendations and instructions. Painted surfaces must be completely clean and continuously smooth. Treat internal and exterior corners and angles formed by intersection of wallboard surfaces and wallboard edges with joint reinforcements system in accordance with manufacturer's standard installation specifications where intersections and edges do not have metal trim. **All joints in gypsum board construction are to be taped and floated. This includes work above ceilings, at concealed places and anywhere else joints in gypsum board construction occur.** A slight egg-shell texture may be acceptable if approved by Architect prior to application. **Heavy "knockdown" texturing is not acceptable.**
- E. Concrete and Concrete Block: Prepare surfaces in strict accordance with paint manufacturer's instructions and recommendations. Remove chalk, dust, dirt, grease, oils and substances which negatively effect paint adhesion. Perform appropriate tests to determine alkalinity and moisture content of surfaces. If surfaces are found sufficiently alkaline to cause blistering and burning of paint, correct condition before applying paint.
- F. Wood: Clean wood surfaces free of dirt, oil, or foreign substances with scrapers, mineral spirits, and sandpaper. Sandpaper smooth those surfaces exposed to view, and then remove dust. Prime or seal wood requiring job painting immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of this wood. Scrape and clean small, dry seasoned knots, and apply thin coat of white shellac or manufacturer's recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty of plastic wood-filler. Sandpaper smooth when dried.

- G. Primed Ferrous Metals: Clean ferrous metals free of dust, grease and grime. Sand smooth rust spots, mars and abrasions in surfaces. Touch-up shop-applied prime coats which have damage or bare areas. Wire-brush, solvent clean, and touch up with same primer as shop coat.
- H. Non-ferrous Metals: Clean off all oxidation, dust, grease and grime.
- I. Galvanized Metal Surfaces: Clean free of oil and surface contaminates with acceptable non-petroleum based solvent. Touch up bare metal with zinc chromate primer.

### 3.03 WORKMANSHIP

- A. Do not perform outside painting in extremely cold, frosty, or damp weather. Do not paint in dusty rooms. If required, sprinkle floors, to lay dust. Do not apply coats of paint on either wet or damp surfaces and in no case unless preceding coat is dry and hard.
- B. Clean surfaces before priming. Remove dirt, oil, grease, rust, scale, and foreign matter. Clean with sandpaper, steel scraper, or wire brushes where necessary.
- C. Specified coats are to cover completed painting and finishing work. Where color, stain, or undercoats show through final coat, install additional coats until uniform coverage is obtained.
- D. Vary tints of undercoats slightly for identification of succeeding coats. Ample time of drying required to secure best possible results.
- E. Coats specified are in addition to shop or mill priming required under other Sections of these specifications.
- F. **All cabinet devices that require finish painting are to be painted with doors in the open position and shall be allowed to dry for a minimum of 24 hours in the open position. DO NOT PAINT DOORS CLOSED AND TRIM AFTER DRYING.**
  - 1. **Cabinets that require finish painting include, but are not limited to, wall and ceiling access doors, fire extinguisher/hose/valve cabinets, electrical panel boxes, etc.**
- G. Corridor partitions, smokestop partitions, horizontal exit partitions, exit enclosures, and fire walls shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Label each wall at 20'-0" maximum. Such identification shall be above any decorative ceiling and in concealed spaces. Approved wording is to be:

#### **FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS**

### 3.04 MOISTURE CONTROL

- A. Give back side of interior wood trim in contact with masonry units one application of water repellent preservative.

### 3.05 PAINT SCHEDULE

- A. Finish surfaces as follows:

<u>SURFACE</u>	<u>TREATMENT</u>
1. <b>Exterior Steel / Ferrous Metals:</b>	<u>1st Coat</u> - SW Pro-Cryl® Universal Acrylic Primer B66W00310 Series (Touch up only on primed surfaces) <u>2nd &amp; 3rd Coats</u> - SW B66W01151 - Pro Industrial DTM Acrylic Semi-Gloss
2. <b>Interior Ferrous Metals:</b>	<u>1st Coat</u> - SW Pro-Cryl Universal Water Based Primer, B66-310 Series (Touch up only on primed surfaces) <u>2nd &amp; 3rd Coats</u> - SW ProMar 200 Alkyd Eg-Shel B33 or S/G B34 as selected by Architect.
3. <b>Interior Aluminum:</b>	<u>1st Coat</u> - SW Pro-Cryl Universal Water Based Primer, B66-310 Series (Touch up only on primed surfaces) <u>2nd &amp; 3rd Coats</u> - SW ProMar 200 Alkyd Eg-Shel B33 or S/G B34 as selected by Architect.
4. <b>Exterior Aluminum:</b>	<u>Primer</u> - SW B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer. <u>2 Coats</u> - SW B66W00351 - Sher-Cryl HPA High Performance Acrylic Semi-Gloss Coating.
5. <b>Galvanized Metals:</b>	<u>1st Coat:</u> SW B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Off White <u>2nd &amp; 3rd Coats:</u> SW B66W01151 Pro Industrial DTM Acrylic Semi-Gloss Extra White.
6. <b>Int. Gyp. Board - Painted:</b>	<u>1st Coat</u> - SW PrepRite High Build Latex Wall Primer/Surfacer, B28W601 <u>2nd &amp; 3rd Coats</u> - SW ProMar 200 Latex Eg-Shel B20-2200 or S/G B31-2200 Enamel as selected by Architect.
7. <b>Int. Gyp. Board - Glazecoat:</b>	SW Water Based Epoxy Resin, B70-200 Series with Gloss Hardener B60V15
8. <b>Interior Conc. - Painted:</b>	<u>1st Coat</u> - SW PrepRite Masonry Primer, B28W300 <u>2nd &amp; 3rd Coats</u> - SW ProMar 200 Latex Eg-Shel B20-2200 or S/G B31-2200 Enamel as selected by Architect.

9. **Interior Conc. - Glazecoat:** Fill concrete with Three (3) Coats of Sherwin Williams Heavy Duty Block Filler, B42W46.  
SW Water Based Epoxy, B70-200 Series with Gloss Hardener B60V15
10. **Exterior Conc. - Painted:** 1st Coat: SW A24W08300 - Loxon® Concrete & Masonry Primer, Interior/Exterior Latex White.  
2nd & 3rd Coats: SW A82W00151 A-100® Exterior Latex Satin Extra White.
11. **Interior CMU - Painted:** Prime Coats - SW PrepRite Block Filler, B25W25 as required to eliminate all pinholes.  
2nd & 3rd Coats - SW ProMar 200 Latex Eg-Shel B20-2200 or S/G B31-2200 Enamel as selected by Architect.
12. **Interior CMU - Glazecoat:** Fill CMU walls with Three (3) Coats of Sherwin Williams Heavy Duty Block Filler, B42W46.  
Apply another coat if more than 10 pinholes within 2' x 2' area.  
  
SW Water Based Epoxy, B70-200 Series with Gloss Hardener B60V15
13. **Exterior CMU - Painted:** 1st Coat: SW B42W00046 - Heavy Duty Block Filler White  
2nd & 3rd Coats: SW A82W00151 A-100® Exterior Latex Satin Extra White.
14. **Architectural Woodwork:  
Stained Interior (Vertical)** Stain Coat - SW Wood Classics Stain  
2nd & 3rd Coats - Gloss or Satin A67 Series, Polyurethane as selected by Architect.
15. **Interior Black-Out Paint:** Prime Coat - Provide manufacturer's recommended primer, undercoat or block filler if required.  
  
1st & 2nd Coats - SW Waterborne Acrylic Dryfall B42B00081, Flat Black.
16. **Wood Athletic Floor:** Refer to Section 09 64 66.

### 3.06 PAINTING OF MECHANICAL AND ELECTRICAL WORK

- A. Painting of pipe and duct insulation and un-coated ferrous metal in inaccessible pipe and duct chases, in plumbing chases, and in spaces above ceiling is not required.
- B. Metal Work in Mechanical Room (finish as follows):
1. Clean pre-finished equipment and touch up with enamel to match manufacturer's final coat.

2. Clean exposed pipe, exposed conduit and electric outlet boxes, hangers and brackets, valve handles, and miscellaneous pipe line devices and give two coats of medium gray enamel.
  3. Clean prime painted or unfinished items of manufactured mechanical and electrical equipment, then prime and finish with two coats of enamel to match other finished items of equipment.
  4. Finish remaining exposed metal items with two coats of light grey enamel.
- C. Paint exposed interior metal work, including ferrous and non-ferrous piping, for heating ventilating, plumbing and electrical equipment, electric cabinets, ventilating grilles, metal access panels. Give exposed metal items one coat of enamel undercoater and one coat of enamel in addition to priming coat.
- D. Give pipe and duct insulation exposed to view one coat glue size and two coats enamel.
- E. **Paint all mechanical, electrical and plumbing items that are visible through registers, grilles and diffusers with Flat Black-Out paint.**

### 3.07 PROTECTION, CLEAN UP, AND TOUCH-UP

- A. Protect all work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint drops and smears from hardware, glass and other surfaces and items.
- C. Before final inspection, touch-up or refinish painted surfaces which have become damaged or discolored.
  1. Perform touch-up work in a manner to produce solid even color and finish texture to match surrounding color and finish texture.
  2. Areas that receive touch-up work and do not match surrounding color or finish texture will be refinished at Contractors expense.

### 3.08 REPAINTING AND REFINISHING

- A. Thoroughly clean existing surfaces in present building to be repainted and give one or more new coats of same type of paint originally used. Clean existing natural finish surfaces, sand and give new coat of varnish or finish originally used. Treat patched and repaired surfaces as new surfaces. For bidding purposes figure two coats of paint as average requirement. Scrape surfaces to be repainted, sand by hand or machine, and prepare to receive new coats.
- B. Paint rooms and areas in existing building noted on drawings to paint existing surfaces or required by Finish Schedule.

- C. Paint all rooms and areas in existing building where cutting and patching occurs. Paint after cutting, patching, and remodeling in rooms and areas is completed. Where cutting and patching is required on only one wall or surface, paint the entire room or area. Where cutting or patching occurs along a corridor wall, paint entire corridor wall from corner to corner or between termination lines designated by Architect.

**END OF SECTION 09 91 00**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install Porcelain Enamel Steel Markerboards.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples and color charts: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color, and texture, where required.
- D. Manufacturer's Instructions: Provide Manufacturer's installation instructions.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Manufacturer shall be a firm engaged in the manufacture of visual display boards in the United States.
  - 2. Manufacturer shall have a minimum of 5 years experience in the manufacture of visual display boards.
- B. Product Certifications: Provide GREENGUARD Indoor Air Quality Certified® and GREENGUARD Gold certificates for markerboard surfaces, as applicable.
- C. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

**1.05 PROJECT CONDITIONS**

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.
- B. Comply with manufacturer's recommendations for acclimating area for interior moisture and temperature to approximate normal occupied conditions.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of visual display boards with spaces sufficiently complete so that visual display boards can be installed upon delivery.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials protected from exposure to harmful weather conditions and at temperatures and humidity conditions recommended by manufacturer.

## 1.05 WARRANTY

- A. Submit a "Life of the Building" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge porcelain enamel steel markerboard and chalkboard writing surfaces are guaranteed for the Life of the Building. The guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.
- B. Writing Surface Warranty Period: 10 years commencing on Date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products may be incorporated in the work include, but are not limited to, the following:
  - 1. Best-Rite Chalkboard Co.
  - 2. Claridge Products and Equipment, Inc. **(Basis-of-Design)**
    - a. Visual Display Board Manufacturer: Claridge Products and Equipment, Inc., Harrison, Arkansas 72601; 800-434-4610; Tel: 870-743-2200; Email: [claridge@claridgeproducts.com](mailto:claridge@claridgeproducts.com) Website: [www.claridgeproducts.com](http://www.claridgeproducts.com)
  - 3. Approved Equal

### 2.02 MATERIALS

- A. Writing Surface Face Sheet - Manufactured in accordance with Porcelain Enamel Institute's specification. Refer to drawings for product numbers and locations.
  - 1. Shall be enameling grade cold rolled steel.
  - 2. Enameling grade steel shall be coated with LCS3 Porcelain Enamel by Claridge Products and Equipment.
    - a. 3-Coat process shall include:
      - i. Bottom Ground Coat - 1.5 to 2.2 mils
      - ii. Top Ground Coat - 2.0 to 2.8 mils
      - iii. Top Cover (Color) Coat - 3.0 to 4.0 mils



3. Firing Temperature: Enamel shall be fired at lowest possible temperatures to reduce steel and porcelain stresses and achieve superior enamel and hardness.
  4. Color: As selected by architect from manufacturer's standards. Color charts furnished on request. NOTE: LCS3 No. 100 can be used as a projection surface.
- B. Writing Surface Core
1. 7/16" Medium Density Fiberboard (MDF) composed of approximately 90% post-industrial waste.
- C. Writing Surface Backing
1. Steel Back

### **PART 3 - EXECUTION**

#### **3.01 PROJECT CONDITIONS**

- A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.
- B. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.

#### **3.02 INSTALLATION**

- A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Do not install boards on damp walls or in damp and humid weather without heat in the building.
- D. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

#### **3.03 ADJUST AND CLEAN**

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

**END OF SECTION 10 11 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install back-painted dry-erase magnetic glass marker boards.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: Provide sample to illustrate finish and texture, where required.

**1.04 REFERENCED STANDARDS**

- A. American National Standard's Institute
  - 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test
- B. American Society for Testing Materials
  - 1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Manufacturer shall be a firm engaged in the manufacture of visual display boards in the United States.
  - 2. Manufacturer shall have a minimum of 5 years experience in the manufacture of visual display boards.
- B. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

## 1.06 PROJECT CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.
- B. Comply with manufacturer's recommendations for acclimating area for interior moisture and temperature to approximate normal occupied conditions.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of visual display boards with spaces sufficiently complete so that visual display boards can be installed upon delivery.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials protected from exposure to harmful weather conditions and at temperatures and humidity conditions recommended by manufacturer.

## 1.08 WARRANTY

- A. Submit a warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge glass marker board writing surfaces are guaranteed for Five (5) years. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Visual Display Board Manufacturer: Claridge Products and Equipment, Inc., Harrison, Arkansas 72601; Toll Free: 800-434-4610; Telephone: 870-743-2200; E-mail: [claridge@claridgeproducts.com](mailto:claridge@claridgeproducts.com); website: [www.claridgeproducts.com](http://www.claridgeproducts.com).
- B. Approved Equal Manufacturers:
  - 1. **Basis-Of-Design:** Clarus Glassboards, Product: Float™, Tel: 888-813-7414, [www.clarus.com](http://www.clarus.com)
  - 2. CGI (General Glass International), which is located at: 101 Venture Way; Secaucus, NJ 07094-1808; Toll Free Tel: 800-431-2042; Tel: 201-553-1850; Fax: 201-553-1851; Email: request info ([sales@generalglass.com](mailto:sales@generalglass.com)); Web: <http://www.generalglass.com>

### 2.02 MATERIALS

- A. Glass Markerboards
  - 1. Glass: 1/4-inch thick, tempered, low-iron, extra clear, safety writing glass with polished edges
  - 2. Glass Markerboard writing surface: Smooth finish intended for use with dry-erase markers

3. Glass Sizes: Sizes available - 2'0" x 3'0" through 4'0" x 8'0" - refer to drawings.
  4. Back-Painting Color: White is standard. Specially formulated powder creates a durable paint/glass bond that is fade resistant, water resistant, heat resistant, and environmentally friendly and free of unsafe chemicals.
  5. Backing: Magnetic glass marker boards have steel backing permanently adhered to the back of the glass.
- B. Mounting Methods
1. MGM - Brushed stainless edge grips for stand-off mounting (4 stand-offs with sizes up to 4' x 6'; 6 with 4' x 6' and 4' x 8')
  2. MGMI - Invisi-Mount - no visible mounting hardware; concealed hanger mounted to back of board. Full-length, minus 3", concealed z-bar hanger for the wall. Furnished with 3M Dual Lock™ fasteners to hold bottom of board firmly in place. MGMI mounting method passed a 500 lb. load test without failure.
- C. Accessories
1. Rare Earth Magnets
  2. Optional Aluminum Accessory tray furnished with double-sided tape
  3. Optional Aluminum Accessory tray furnished with rare earth magnets
  4. Optional Marker Caddy and Magnetic Eraser

## **PART 3 - EXECUTION**

### **3.01 PROJECT CONDITIONS**

- A. Interior moisture and temperature should approximate normal occupied conditions.
- B. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.

### **3.02 INSTALLATION**

- A. Deliver factory-built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Do not install on damp walls or in damp and humid weather without heat in the building.
- D. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

### **3.03 ADJUST AND CLEAN**

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean surfaces, and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

**END OF SECTION 10 11 16**

**PART 1 - GENERAL****1.01 SUMMARY**

- A. General: Provide all labor, materials, equipment, tools and services, necessary to complete the fabrication and installation of the Work, as indicated by the Drawings.
- B. Coordination: Assign a Project Manager prior to beginning Work for coordination with the Owner for complete understanding and execution of the project requirements throughout the entire project. This includes, but is not limited to project meetings, submission review, fabrication and installation.
- C. Provide 911 address signage on outside of building as required by local municipality and NFPA:
  - 1. NFPA 1 Fire Code 2018: New and existing buildings shall have approved address numbers placed in a position to be plainly legible and visible from the street or road fronting the property. Address numbers shall be a minimum of 4 inches (100 mm) high with a minimum stroke width of 1/2 inches (13 mm).

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: List sign styles, lettering, materials, thicknesses, locations and dimensions of each interior sign.
- D. Selection Samples: One complete set of color chips representing manufacturer's full range of available colors.
- E. Verification Samples: Two full size samples representing each type, style, material, thickness, and color specified, including method of attachment.

#### **1.04 QUALITY ASSURANCE**

- A. Use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, and thoroughly familiar with requirements of this work.
- B. Regulatory Requirements: Comply with requirements of ICC/ANSI A117.1 and ADAAG.

#### **1.05 PRODUCT HANDLING**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

### **PART 2 - PRODUCTS**

#### **2.01 BUILDING SIGNAGE**

- A. Contractor to allow the sum as stipulated in Section 01 21 00 - Allowances, in the Base Bid for purchase, taxes, delivery to site and installation of all exterior and interior building signage to be selected by Architect. Allow minimum 6-8 weeks for production and installation of typical identification signage prior to local Certificate of Occupancy.
- B. All signage to be purchased under the stated allowance will comply with the 2017 ICC ANSI A117.1 Accessible and Usable Buildings and Facilities ADA Standards for size, location, color, type face and braille.
- C. Allowance does not include building plaque specified below.
- D. Allowance shall include building address numbers as may be required by local municipality. Minimum 4" high premium vinyl decals on pre-spaced sheet in color and font as selected by architect, or as otherwise indicated on the drawings. Coordinate location with local Authority Having Jurisdiction.

#### **2.02 BUILDING PLAQUE**

- A. Provide one cast aluminum metal 24" x 36" building plaque installed with concealed mounting, where directed.
- B. Letter Style: Standard fonts conforming to copy supplied by Architect.
- C. Furnish single line border edges and polished letters on background similar to light pebble.



## **2.03 FEDERAL ACCESSIBLE RESERVED PARKING SIGNAGE (ACCESS SIGNS)**

- A. Supplier: ADA Sign Depot, Inc., 10531 4S Commons Drive #622, San Diego, CA 92127, PHONE: 1-858-385-9095, or approved equal.
- B. Provide 12" wide x 18" high Federal R7-8 Handicap Parking sign as indicated on the drawings.
  - 1. Meets all Federal MUTCD (Manual of Uniform Traffic Control Devices) Specification for Design, Materials and Manufacturing
  - 2. Engineer Grade Prismatic Reflective sign face.
  - 3. Heavy-gauge .063 aluminum.
  - 4. Durable, Rust-Free, and Rated for a Minimum of 7 Years Outdoor No Fade Service.
  - 5. Parking sign is pre-drilled with standard .375-inch diameter holes at top and bottom center for easy mounting to posts or walls.
- C. Provide 12" wide x 18" high Federal R7-8-MOD Van Accessible Handicap Parking sign as indicated on the drawings and matching criteria for R7-8 sign.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install signage in accordance with manufacturer's recommendations.

**END OF SECTION 10 14 00**

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**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. General: Provide all labor, materials, equipment, tools and services, necessary to complete the fabrication and installation of the Work, as indicated by the Drawings.
- B. Coordination: Assign a Project Manager prior to beginning Work for coordination with the Owner for complete understanding and execution of the project requirements throughout the entire project. This includes, but is not limited to project meetings, submission review, fabrication and installation.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, and thoroughly familiar with requirements of this work.

**1.05 PRODUCT HANDLING**

- A. Protection: Protect other items under this Section before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

**1.06 ARTWORK**

- A. Typography:
  - 1. Each typeface shall be identified at the beginning of each section of the submittal package. Fabricator shall purchase required fonts from specified font foundries.

2. Lettering shown on the drawings is intended as guidelines for layouts and type size only, and is based on scale calculations of the message lengths within estimated sign areas.
3. All type shall be straight and accurately spaced with square corners, uniform curves, correct spelling and punctuation, and all finishes smooth with no visible imperfections.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design: Subject to compliance with requirements, provide products that meet or exceed material, performance, design, appearance, and finish characteristics of the product supplied by sources listed. **Owner to have final approval of letter style.**
  1. Archway Graphic Designs, 1202 Business Park Drive, Little Rock, AR72204, Tel. 501-224-0227, [blusk@archwaygraphic.com](mailto:blusk@archwaygraphic.com)
- B. This section does not include traffic control signage.

### **2.02 MATERIALS (METAL ALLOYS)**

- A. General:
  1. Letter style and logo to match drawings
  2. Faces: 3/16" acrylic, precision-routed face
    - a) Stock Acrylic Face Colors: Translucent White
      - i) Letter Color: 3M Dual Color black vinyl overlay
      - ii) Logo Color: Digitally printed & laminated vinyl
      - iii) Stock Trim Colors: Silver
  3. Backs: 3mm aluminum composite; mounting and electrical holes are precision-routed into the letter back.
  4. Returns: Standard 5" return, .040 aluminum.
    - a) Return Colors: Brushed Silver, Matthews acrylic polyurethane
  5. LED: Principal Street Fighter White LED's (3 LED's per module and 2 modules per foot)
  6. Assembly Options: Remote Pre-wired with 4' leads, Led components and gang boxes. UL listed
  7. Hardware Options: Remote-no hardware, remote-nesters with aluminum threaded rod (1/4" or 3/8").
  8. Mounting Patterns: All remote projects include a full size mounting pattern.

### **2.03 FABRICATION**

- A. Preassemble signs in the fabrication facility to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

- B. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
- C. Construct all work to eliminate burrs, dents cutting edges and sharp corners.
- D. All work done shall be machine fabricated in accordance with approved shop drawings with straight lines, square corners or smooth bends, free from twists, kinks, warps, dents and other imperfections which may affect appearance or serviceability. Curved sections shall be formed to smooth and even radii.
- E. Flatness: Finished panels shall have a maximum variation of .188" in a convex direction when measured perpendicular to the nominal plane of the panel face. Variation in the concave direction when measured perpendicular to the nominal plane of the panel face. Variation in the concave direction shall be limited to .094, from the actual plane of the panel face. These tolerances are for panels with a face area of 8 square feet or less. Proportionately greater allowance will be permitted for panels of greater areas.
- F. Squareness: Panels of less than 8 square feet shall be square within .063" as measured across the diagonal and within .094" on panels over 8 square feet.
- G. Forming: All forming shall be via mechanical equipment and shall be completed prior to the coating.
- H. Surfaces that are intended to be flat shall be without dents bulges, oil canning, gaps or other physical deformities.
- I. Welding: Fusion welds must be free of porosity, inclusions, foreign matter, cracks and pinholes. Any welds wire or rod fillers used must match the chemical composition of the base metal. All welds shall be ground and sanded smooth to match the radius of the mechanical break.
- J. Exercise care to assure that polished, plated or finished surfaces are unblemished in the finished work.
- K. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals.
- L. Finish all surfaces smooth, except as otherwise noted.

## **2.04 MOUNTING**

- A. Flush Mount (FM): Studs are set in adhesive cement. There is no space between the letter and the wall surface.
- B. Projected Jam Mount (PJM): Studs are set in adhesive cement. Stainless steel jam nuts are inserted between the letter and the wall surface.

- C. Projected Spacer Mount (PSM): Studs are set in adhesive cement. Pre-cut spacers are inserted between the letter and the mounting surface.
- D. Wall Mount (WM): Where you have access to the rear of the wall, washers and nuts are used on both sides.
- E. Bottom Mount (BM): Letters are drilled and tapped from the bottom for placement on aluminum bar for aluminum letters and stainless steel bar for bronze letters. Rounded letters will be flattened to receive studs. Large letters will require tie-backs. 3/8" and thicker letters only. Ships unassembled. Extra charge will apply. Maximum piece is 8'. Bar included.
- F. Rail Mount (RM): Letters are drilled and tapped for placement on two rails. Aluminum rails on aluminum letters and stainless steel rails on bronze letters. Maximum length is 8' per individual rail section. Available on letters 4" to 24". Ships unassembled. Extra charge will apply. Maximum piece is 8'. Rail included.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examination - On Site
  - 1. Examine areas with Signage Contractor and Owner present, for compliance with requirements for installation and other conditions, which will adversely affect execution, permanence and quality of work. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to the Owner have been made.

#### **3.02 INSTALLATION - SURFACE MOUNTED SIGNS**

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with Manufacturer's written instructions.
- B. Install signs level, plumb and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
- C. Wall-Mounted Signs: Comply with Manufacturer's written instructions except where more stringent requirements apply. Use mounting methods indicated.
- D. Mechanical Fasteners: Where indicated, use nonremovable mechanical fasteners placed through pre-drilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by Manufacturer.

### **3.03 CLEANING AND PROTECTION**

- A. After installation, clean soiled sign surfaces according to Manufacturer's written instructions. Protect signs from damage until acceptance by Agency.

**END OF SECTION 10 14 19**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Furnish and install solid plastic toilet compartments including the following:
  - 1. Floor mounted overhead-braced toilet compartments.
  - 2. Floor mounted overhead-braced privacy screens.
  - 3. Floor mounted overhead-braced entry partitions.
  - 4. Floor mounted urinal screens.
  - 5. Wall mounted urinal screens.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include coordinated dimensions for equipment and furnishings specified in other Sections.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

**1.04 REFERENCES**

- A. ASTM International (ASTM):
  - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM B 85 - Standard Specification for Aluminum-Alloy Die Castings.
  - 3. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

- B. National Fire Protection Association (NFPA):
  - 1. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A company regularly engaged in the manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years' experience.
- C. Performance Requirements:
  - 1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
    - a. Class B flame spread/smoke developed rating, tested to ASTM E84.
  - 2. Material Fire Ratings:
    - a. National Fire Protection Association (NFPA) 286: Pass.

#### **1.06 PRODUCT HANDLING**

- A. Protection: Protect toilet partitions and other items under this Section before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in the manufacturer's unopened packaging until ready for installation.
- B. Protect finished surfaces from soiling or damage during handling and installation.

#### **1.08 COORDINATION AND SCHEDULING**

- A. Schedule delivery of access flooring so that spaces are sufficiently complete and access flooring materials can be installed immediately following delivery.

#### **1.09 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer's absolute limits.

## **1.10 WARRANTY**

- A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. (Labor not included in warranty.)

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email:request info (info@scrantonproducts.com); Web: [www.scrantonproducts.com](http://www.scrantonproducts.com)

### **2.02 MATERIAL**

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface;
  - 1. Fire-resistance Rating: Tested in Accordance with NFPA 286.
  - 2. Fire-resistance Rating: Tested to meet ASTM E84, Class B.
  - 3. Standard Collection, Does not meet NFPA 286 or ASTM E84
- B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.
- C. Aluminum Die Castings: ASTM B85, A380 alloy.
- D. Stainless Steel Castings: ASTM A167, Type 304.
- E. Rubber: Abrasion resistant Styrene Butadiene Rubber, 65 to 80 Shore A durometer, black.

### **2.03 SOLID PLASTIC TOILET COMPARTMENTS AND SCREENS**

- A. Basis of Design: Eclipse Toilet Partitions as manufactured by and supplied by Scranton Products.
  - 1. Style: Floor mounted overhead-braced toilet compartments.
- B. Doors and Panels: High density polyethylene (HDPE), fabricated from SEQ CHAPTER 1 extruded polymer resins, forming single thickness panel.
  - 1. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
  - 2. Thickness: 1 inch (25 mm).
  - 3. Edges: Shiplap.

- C. Panel Color: Traditional Series:
  - 1. Shale - Orange Peel - (Verify final selection with architect).
  
- D. Doors and Dividing Panels:
  - 1. Standard Privacy:
    - a. Height: 55 inches high and mounted at 14 inches above the finished floor.
  - 2. High Privacy:
    - a. Height: 62 inches (1575 mm) high and mounted at 8 to 14 inches above the finished floor.
  - 3. Extra Privacy:
    - a. Height: 71-1/2 inches high and mounted at 4 inches above the finished floor.
  
- E. Metal Posts: 82.75 inches (2102 mm) high, heavy duty extruded aluminum, clear anodized finish, fastened to foot with stainless steel tamper resistant screw.
  
- F. Hidden Shoe (Foot): One-piece molded polyethylene invisible shoe inserted into metal post and secured to metal post with stainless steel tamper resistant screw.
  
- G. Headrail Cap and Corner Cap: One-piece molded polyethylene secured to metal post with stainless steel tamper resistant screw; adjustable to level headrail to finished floor.
  
- H. Wall Brackets: Continuous heavy duty extruded aluminum, clear anodized finish, inserted into slotted panel and fastened to panels with stainless steel tamper resistant screws.
  - 1. Type: Single Ear bracket aluminum.
  - 2. Type: Double ear bracket aluminum.
  - 3. Length: 54 inches (1372 mm).
  - 4. Length: 61 inches (1550 mm).
  - 5. Length: 71 inches (1803 mm).
  
- I. Headrail: Heavy duty extruded aluminum, designer anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper resistant screw.
  - 1. Headrail Brackets: Heavy duty extruded aluminum, clear anodized finish, secured to wall with stainless steel tamper screws.
  
- J. Door Hardware:
  - 1. Hinges:
    - a. Edge-mounted helix style stainless steel continuous hinge.
      - 1) Closing degree: 5 degrees.
      - 2) Comes to a full close on its own weight
  - 2. Occupancy Indicator Latch and Housing:
    - a. Material: Satin stainless steel.
    - b. Occupancy indicators: Green for occupied and red not occupied.
    - c. Slide bolt and button.

3. Coat Hook and Door Bumper Combination:
  - a. Material: Chrome plated Zamak
  - b. Handicap Door: Equip with second door pull and door stop.
4. Door Pulls: Chrome plated Zamak

## **2.04 OTHER MATERIALS**

- A. Provide materials, not specifically described but required for complete and proper installation of specified items, selected by Contractor subject to approval of Architect.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas receiving toilet partitions, panels and pilasters for correct height and spacing of anchorage, blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the Architect.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **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.
- C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

### **3.03 INSTALLATION**

- A. A. Install in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Install partitions rigid, straight, plumb, and level.
- C. Locate bottom edge of doors and panels 4, 9, or 14 inches (102, 229, or 356 mm) above finished floor.
- D. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch (9.5 mm).

- E. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
- F. Finished surfaces shall be cleaned after installation and be left free of imperfections.
- G. Adjust doors and latches to operate correctly.

**3.04 PROTECTION**

- A. Touch-up, repair or replace damaged products before Substantial Completion.
- B. Protect installed products until completion of project.

**3.05 CLEANING**

- A. Clean surfaces to remove soiling, stains, dust, and dirt using materials acceptable to manufacturer.
- B. Touch-up, repair or replace damaged products and defective work, as directed by Architect.
- C. Leave installation area clean, free of residue and debris resulting from work of this Section.

**END OF SECTION 10 21 13.19**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Furnish and install metal accessories called for in Toilet Accessory Schedule.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: Submit a sample of each component illustrating color and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

**1.04 REFERENCES**

- A. 2021 Arkansas Fire Prevention Code (IBC 2021), Chapter 11 - Accessibility.
- B. BABIES Act, or Bathrooms Accessible In Every Situation Act (2016) requiring changing tables in all publicly accessible federal buildings as determined by the GSA.
- C. 2017 ICC A117.1 - Accessible and Usable Buildings and Facilities.
- D. 2010 ADA Standards for Accessible Design.
- E. ADA Accessibility Guidelines for Buildings and Facilities, July 23, 2004 – Provisions for Children.
- F. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM A167-99 (Re-approved 2004) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

- H. ASTM A269/A269M-2015 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- I. ASTM A794/A794M-2018 - Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled.
- J. ASTM B456-2003 - Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

## **1.05 QUALITY ASSURANCE**

- A. Use personnel skilled in work required, completely familiar with manufacturers' recommended methods of installation, and thoroughly familiar with requirements of this work.

## **1.06 PRODUCT HANDLING**

- A. Protection: Protect toilet and bath accessories before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.01 METAL TOILET ACCESSORIES**

- A. Manufacturers and Accessory Numbers are listed in Toilet Accessory Schedule. Manufacturers who may furnish products for review by Architect are:
  - 1. American Specialties
  - 2. Bobrick
  - 3. Bradley
  - 4. comfortdesigns
  - 5. Delta Faucet
  - 6. McKinney
  - 7. Approved Equal

### **2.02 MATERIALS**

- A. Stainless Steel: AISI Type 302/304, with "Brushed" finish, 0.034-inch (22-gage) minimum thickness.
- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.



- D. Galvanized Steel Sheet: ASTM A 527, G60.
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

### **2.03 FASTENERS**

- A. Provide screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

### **2.04 PLUMBING PIPE WRAP**

- A. At all exposed lavatory piping, provide TRUEBRO Lav Guard® 2, Fast Fit Undersink Piping Covers as manufactured by IPS Corporation, 202 Industrial Park Lane, Collierville, TN 38017, 800-340-5969 or approved equal.
  - 1. Use at all sinks or lavatories that do not have removable apron.
  - 2. Do not provide if plumbing documents have made provisions for this or other method of protection.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Coordinate with other trades to ensure proper and adequate provision in framing and wall finish for installation of selected accessories.
- B. Prior to installation, inspect location of accessories and verify that necessary provisions have been made. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

### **3.02 INSTALLATION**

- A. Install accessories in accordance with manufacturers' recommendations, anchoring components firmly in place.

**END OF SECTION 10 28 13**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Firefighting devices consist of hand-portable fire extinguishers and metal cabinets, and accessories.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. NFPA 10 - Standard for Portable Fire Extinguishers
- B. ADA Accessibility Guidelines
- C. IBC/IFC Tables 906.3(1) and 906.3(2) for determining extinguisher rating, fire classification, hazard classification, and travel distance.
- D. UBC Standard 7-5 (ASTM E-814-83) - Fire-rated cabinet option for combustible and non-combustible walls.

**1.05 QUALITY ASSURANCE**

- A. Provide fire extinguishers, cabinets, and accessories by a single manufacturer.

**1.06 PRODUCT HANDLING**

- A. Protection: Protect firefighting devices before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
1. **Basis of Design:** Larsen's Manufacturing Co., 7421 Commerce Ln NE, Minneapolis, MN 55432, (763) 571-1181 or (800)527-7367.
  2. Potter Roemer, 17451 Hurley St, City of Industry, CA 91744 Phone: (800) 366-3473 E-mail: [info@potterroemer.com](mailto:info@potterroemer.com)
  3. JL Industries, Activar Construction Products Group, 800-554-6077. Email: [sales@activarcpg.com](mailto:sales@activarcpg.com)
- B. Abbreviations:
- |       |   |
|-------|---|
| SRC-1 | Semi-Recessed Cabinet                         |
| WHE-1 | Wall Hung Extinguisher (with clip or bracket) |
| FEB-1 | Fire Extinguisher Bracket                     |

### **2.02 FIRE EXTINGUISHERS**

- A. **Type 1:** Provide multi-purpose dry chemical type, Model MP-10 with UL Rating 4A-80B:C for Class A, B and C fires manufactured by Larsen's®, or approved equal.
- B. **Type 2:** Provide "K Class", Model WC-6L wet chemical type with UL rating of 2A:1B:K manufactured by Larsen's®, or approved equal. Provide manufacturer's standard wall mount bracket No. 1007.

### **2.03 FIRE EXTINGUISHER CABINETS**

- A. **SRC-1:** Construct cabinets from 18 gauge, or heavier, stainless steel with #4 finish. Provide Larsen's®, rolled edge semi-recessed "Architectural Series" No.SS2409-6R, or approved equal, with "Vertical Duo" doors. Lettering, if required, to be black vertical Type 'A' die cut; verify with Owner and local Authority Having Jurisdiction (AHJ) or fire code official (Note: lettering typically not required). Mount at 56" to top of housing in masonry wall construction, maintaining consistent height at all wall types. Neither the extinguisher handle nor the cabinet handle shall be mounted higher than 48" AFF, per ADA.
- B. Provide fire rated cabinets if required to be installed in a fire rated wall.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Coordination: Coordinate with other trades to ensure proper and adequate provision in framing and wall covering for installation of recessed cabinets.

- B. Inspection:
1. Prior to installation, inspect cabinet recesses, and verify that necessary provisions have been made.
  2. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

### **3.02 INSTALLATION**

- A. Install the items of this Section in strict accordance with the original design, approved shop drawings, and requirements of agencies having jurisdiction, as approved by the Architect, anchoring all components firmly into position.

### **3.03 SERVICE**

- A. Determine approximate completion date of Work. Inspect, charge, and tag fire extinguishers at date not more than ten days before or less than one day before actual completion date of the Work.

**END OF SECTION 10 44 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Provide steel wardrobe and box lockers, and accessories specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Provide each type of metal locker as a complete unit produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- B. Warranty: Manufacturer warrants lockers against defects in materials and workmanship for a period of ten years from the date of substantial completion of the project.
- C. Lockers shall be GREENGUARD Gold Certified through UL Environment's GREENGUARD Certification Program.

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Do not deliver lockers until building is enclosed and ready for their installation. Protect from damage during delivery, handling, storage and installation. At Contractor's expense, replace damaged lockers or components.

**1.06 WARRANTY**

- A. All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. Provide lockers as manufactured by one of the following:
1. List Industries, Inc.
  2. LockersMFG, Batesville, MS, 662-338-4340
  3. Lyon Metal Products
  4. Penco
  5. Republic Steel Corp.
  6. Approved equal products, manufactured in the United States, and meeting the specifications set forth below.

### 2.02 MATERIALS

- A. Type of lockers required include:
1. **Athletic Type:** Body Construction: Fully-Framed All-Welded type Double tier wardrobe lockers, 12" x 12" x 72" size with continuous integral sloped tops and no base, expanded metal doors, recessed handle for padlock, and number plates.
  2. **P.E. Type:** Body Construction: Fully-Framed All-Welded type Six Tier P.E. lockers, 12" x 12" x 72" size with continuous integral sloped tops and Zee base, standard door louvers, recessed handle for padlock, and number plates.
  3. **Staff Type:** Body Construction: Fully-Framed All-Welded type Double Tier wardrobe lockers, 12" x 12" x 72" size with flat tops and Zee base, standard door louvers, recessed handle for padlock, and number plates.
- B. Sheet Steel: Cold-rolled steel for doors and door frames.
- C. Fasteners: Cadmium, zinc or nickel plated steel. Exposed bolt heads, slotless type. Provide self-locking nuts or lock washers for nuts on moving parts. Do not expose bolts or rivet heads on fronts of lockers or frames.
- D. Equipment: Provide hooks and hand rods of cadmium plated steel or cast aluminum.

### 2.03 FABRICATION

- A. Sides and Backs: 24 gauge steel, flanged on two sides to give double thickness of metal at connections.
- B. Tops, Bottoms and Shelves: 24 gauge zinc coated steel, flanged on all four sides to give double thickness of metal at connections. **Provide sloped tops.**
- C. Door Frames: 16 gauge formed steel channels. Vertical members shall have an additional flange to form continuous door strike. Corners shall be lapped and welded into a rigid assembly.



- D. Door: Doors shall be 16 gauge steel with channel-formed vertical edges and 90 degree angle flanges at top and bottom. Doors shall have 24 gauge die-formed pans containing acoustical deadening material spot welded to inner side.
- E. Door Jambs: Lockers shall have jambs welded to side of door frames to engage locking device. Design and gauge of jamb shall prevent freeing of locking device by prying. Each jamb shall have safety reverse nose to eliminate hazard of sharp pointed edges protruding into the locker. Each jamb shall have a soft-rubber silencer secured through hole in jamb and upright member.
- F. Hinges: Not less than 2" high, featuring .050" steel, 5-knuckle, full loop forming double thickness on each leaf. Hinge pins to be spun over at ends.
- G. Latching: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 12 gauge (minimum) and shall be MIG welded to vertical frame member. Provide three latch hooks for doors 48" and over and two for doors under 48".
- H. Handle: Seamless drawn 304 stainless steel recessed handle.
- I. Coat Hook: Manufacturer's standard number and configuration. All hooks are to be zinc-plated or subjected to comparable rust retardant treatment and attached with two bolts.
- J. Number Plates: Aluminum plates with figures at least 3/8" high, either embossed or etched and attached near top of door.
- K. Finish: Exposed steel parts shall be thoroughly cleaned, given a bonding and rust inhibitive phosphate treatment and then electrostatically sprayed with a heavy coat of high quality baked enamel. Finish color(s) selected by Architect from manufacturer's complete line.

#### **2.04 LOCKER ACCESSORIES**

- A. LOCKS (If required):
  - 1. Built-In Combination Locks: Built-in combination automatic dead bolt locks with 5 control keys. Locks must be capable of a minimum of five combination changes.
  - 2. Combination Padlocks: Combination padlock, key controlled.
- B. EQUIPMENT: Furnish each locker with the following items, unless otherwise shown.
  - 1. Single tier lockers: Openings 60" and 72" shall include one hat shelf, one double prong ceiling hook and a minimum of two single prong wall hooks.
  - 2. Double tier lockers: Openings 30" thru 36" high shall include one double prong ceiling hook and a minimum of two single prong wall hooks.

3. Triple tier lockers: Openings 20" thru 24" high shall include one double prong ceiling hook.
  4. Finished End Panels (If required): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
  5. Continuous Slope Tops (If required): Not less than 18 gauge sheet steel approximately 18 degrees pitch, in lengths as long as practical but not less than four lockers. To be installed in addition to the locker flat top with end closures for support. Finished to match lockers.
  6. Fillers (if required): Provide where indicated, of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.
- C. FINISHING: All locker parts to be cleaned and coated after fabrication with a seven stage hot-spray washing process and coated with a zirconium-based nanotechnology providing a green alternative to traditional iron phosphate followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the door and foot locker seat may be one of any other color chosen from manufacturers standard selection.
- D. Lockers shall be GREENGUARD GOLD Certified.

## **2.05 BENCHES**

- A. Provide Superior ® 9-1/2" x 5' long x 3/4" thick made from Wilsonart® phenolic in choice of 18 standard colors. Include 4810 enameled heavy-duty steel pedestals.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Carefully inspect installed work of other trades and verify that work is complete to point where this installation may properly commence. Verify that lockers may be installed in complete accordance with manufacturer's recommendations and conditions identified in Contract Documents. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.
- B. If actual field dimensions vary from dimensions shown on Drawings, notify Architect prior to commencing work.

### **3.02 INSTALLATION**

- A. Install lockers at locations shown in accordance with manufacturer's instructions for a plumb, level, rigid and flush installation.
- B. Anchor components firmly in place in complete accordance with manufacturer's recommendations.
- C. Touch-up any marred finishes or replace as directed by Architect. Use only materials and finishes as recommended or furnished by the locker manufacturer.

### **3.03 ADJUSTMENT**

- A. Upon completion of installation, and as a condition of its acceptance, adjust components for proper operation and straight alignment.

**END OF SECTION 10 51 13**

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**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work Included: Furnish and erect flagpoles specified, including foundations, truck, halyards, cleats, and other fittings required. Flags not required.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Design Criteria: Provide flagpole and installation constructed to withstand wind velocity of 90 mph, un-flagged, unless otherwise indicated. Use heavy pipe sizes if required for flagpole type and height.
- B. Provide each flagpole as complete unit produced by single manufacturer, including fittings, accessories, bases and anchorage devices.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Spiral each flagpole with heavy kraft paper or protective wrapping. Prepare for shipment in hard fiber tube or other protective container.
- B. Deliver flagpole and accessories completely identified for installation procedures. Handle and store flagpole to prevent damage or soiling.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Acceptable manufacturers:
  - 1. Acme Flagpole Company
  - 2. American Flagpole
  - 3. Baartol Company
  - 4. Concord American Flagpole
  - 5. Morgan-Francis Company
  - 6. Approved equal.

### **2.02 FLAGPOLE**

- A. Cone tapered, aluminum. Fabricate flagpole from seamless extruded aluminum tubing, alloy 6063-T6, having minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 30,000 psi and yield point of 25,000 psi. Heat-treat and age-harden aluminum flagpole.
- B. Pole Construction: Construct pole and ship in one piece, if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weathertight and invisible field joints
- C. Cone Taper: Manufacturer's standard seamless, uniform straightline tapered section above a cylindrical butt section.
- D. Size: 40' - exposed height.
- E. Quantity: One (1) at 40'.
- F. Foundation:
  - 1. 16 gage minimum galvanized corrugated steel tube of size required.
  - 2. Furnish complete all welded construction with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges.
  - 3. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.
- G. Finish: Satin aluminum, clear anodized.

### **2.03 FLAGPOLE FITTINGS**

- A. Finial (Ornament): Finial sized as indicated or, if not indicated, to match pole butt diameter.

- B. Internal Revolving Truck Assembly: Cast aluminum two-piece enclosed body, revolving, non-fouling design, single aluminum pulley mounted inside hood, stainless steel roller bearings, brass exit bushing for wire cable, and threaded aluminum spindle for attachment to top of pole. Poles 50' and over will have sealed bearings.
- C. Internal Halyard Winch System: Provide one (1) complete internal halyard 1/8" stainless steel wire cable assembly with plastic coated counterweight and beaded sling assembly. A manually operated mechanical winch having automatic brake system and operated with a removable hand crank will be concealed inside the flagpole behind a flush access door having a cylinder lock.
- D. Halyard Flag Snaps: Provide two (2) stainless steel swivel snap hooks with neoprene covers.
- E. Flash Collar: Provide Spun Aluminum Collar to match flagpole.

### **PART 3 - EXECUTION**

#### **3.01 SURFACE CONDITIONS**

- A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of this work.
- B. Do not proceed until unsatisfactory conditions are corrected.

#### **3.02 ERECTION**

- A. Erect flagpole and accessories in strict accordance with manufacturers' recommendations. Align plumb to vertical tolerance of one in 1,000 and adjust operating components for optimum smoothness of operation.

**END OF SECTION 10 75 00**

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**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Provide other miscellaneous specialties specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Furnish at least one person, present at all times, thoroughly familiar with installation requirements of each item, to personally supervise installation.

**1.05 PRODUCT HANDLING**

- A. Protection: Protect miscellaneous specialty items before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements at Contractor's expense.

**PART 2 - PRODUCTS**

**2.01 RAPID ENTRY SYSTEM**

- A. Provide Knox-Box® emergency entry key box by Knox Co., 949-252-8181 or approved equal. Provide Model #3274 Recess Mount in Dark Bronze color and #3290 Hinged Door Recessed Mounting Kit. Contractor to contact local fire department to apply for authorization to order box and verify location. Orders are not accepted without authorized signature of local fire official. Recommended mounting height is 72" to top of box to help deter vandalism. Verify with local Authority Having Jurisdiction (AHJ).

## **2.02 CUBICLE CURTAIN AND TRACK**

- A. Cubicle Track System: Provide Clickeze® Privacy Systems Whisper Cube® Curtain Track 1.20" wide x 1.14 high", extruded PVC channel track with 0.090" minimum wall thickness in White finish as manufactured by inpro®. Provide accessories for complete installation, including the following:
  - 1. Roller Carriers: Provide molded nylon roller carriers, with chrome plated or stainless steel hooks and chain. Provide at least 2 carriers per linear foot of track.
  - 2. Accessories: Provide necessary connectors, caps, end stop, etc. as required. Gridclip track attachment to conform to lay-in ceiling panel and grid profile.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Prior to installation, verify items may be installed in accordance with manufacturers' recommendations.
- B. Notify Architect of conditions that would adversely affect installation.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install miscellaneous specialties in strict accordance with manufacturers' current recommendations and instructions.

### **3.03 ADJUSTMENT AND CLEANING**

- A. Verify that trim is in place and adjust components.
- B. Remove labels from equipment and remove packing materials from job site.

**END OF SECTION 10 80 00**

## SECTION 11 40 00 - KITCHEN EQUIPMENT

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The drawings and general provisions of the contract, including general and supplementary conditions and general documents, apply to the work specified in this section.

#### 1.2 SCOPE OF WORK

- A. Include all labor, materials, and freight required to deliver, install, set in place, level, hang hood(s), erect walk in(s), run refrigeration line(s), etc. for the equipment specified in this section.

#### 1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Recessed and raised floor areas including reinforced concrete wearing bed and specified floor material with coved corner bases inside walk-ins by Division 03 00 00.
- B. Millwork not specified in this section is to be provided under Division 06 00 00.
- C. Rough-in, final connection, indirect drains, drain traps, grease traps, steam traps, PVC for drink lines, strainers, water coolers, hand sinks, mop sinks, tailpieces, valves, stops, shut off valves, pipes, line strainers, atmospheric vents, pipe fittings, ventilators, duct work, exhaust and supply fans, disconnection and reconnection of existing equipment and all materials not specified in this section are to be provided and installed by Division 22 00 00 and Division 23 00 00.
- D. Rough-in, final connection, lines, disconnect switches, safety cut off, fittings, outlets, convenience outlets, pull boxes, wiring, conduit, junction boxes, fuse boxes, control panels, starters, shunt trip breakers (required for the shut off of all electrical outlets under the ventilator and shut off of ventilator fan(s) in the event the fire suppression systems is activated), contactors, disposer and walk-in control wiring, inter connection of fire suppression system with building alarm, disconnection and reconnection of existing equipment and all materials not specified in this section are to be provided and installed by Division 26 00 00, Division 27 00 00 and Division 28 00 00.

#### 1.4 FEES, LICENSES, INSPECTION, PERMITS AND TAXES

- A. Pay all fees, licenses, inspections, permits and taxes required by state and local authorities for the equipment specified in this section and furnish receipts for same.

#### 1.5 JURISDICTIONS, TRADE AGREEMENTS AND RESTRICTIONS

- A. Portions of this work may be sub-contracted to those qualified to do such work as may be required because of jurisdictional trade agreements and restrictions.

#### 1.6 QUALITY ASSURANCE

- A. Submit evidence to the owner, architect and consultant of qualifications listed below:
  1. Successful completion of projects of comparable size and scope.

2. Maintain a staff experienced in the installation of Kitchen Equipment and the preparation of professional drawings and brochures.

## 1.7 SUBSTITUTIONS

- A. It is the purpose of these plans and specifications to purchase for the owner equipment that conform to the best existing policies of the commercial kitchen equipment Industry. These items have been selected as preferred items as a result of past experiences, functional design, construction, material, maintenance and repair. If a contractor elects to quote on substitutions not specified, they will be permitted to do so provided that they list these substitutions on a separate form (do not use alternates in the base bid unless pre approved) outlining them as additions or deductions to the specified brand. Any contractor offering a substitution shall accompany the bid with complete construction details, and specification sheets.
- B. If a proposed substitution is accepted the kitchen equipment contractor shall provide and pay for all changes to, space, structure, utilities, construction, professional services, modify other items, provide rough in drawings, specifications, etc. that may be required.

## 1.8 INTERPRETATION OF DOCUMENT

- A. The specifications and drawings are complementary and what is called for by one shall be binding as if called for by both. Contractors shall examine the full set plans and specifications to be fully satisfied as to the conditions of the project. No allowance shall be subsequently made to the contractor by reason of error on his part or obvious oversight not called to the attention of the Owner, Architect, General Contractor and Consultant.
- B. Questions regarding specifications and drawings will be responded to by written addendum only.

## 1.9 WARRANTIES

- A. Warranties for parts and labor in writing for all new Kitchen Equipment for a period of one year from date of acceptance.
- B. Refrigeration system compressors shall be warranted for an additional four years by the manufacturer.
- C. Provide at no cost to owner, refrigeration service including freon, mileage, parts and labor to all refrigeration equipment within 24 hours of notification for one year from date of acceptance.

## 1.10 REGULATIONS AND CODES

- A. Comply with all applicable laws, statues, building codes, regulations of state, local, public authorities and comply with the following:
  1. National Sanitation Foundation.
  2. National Fire Protection Association.
  3. Underwriter's Laboratories, Inc.
  4. Department of Energy's 2017 Energy Efficiency Standards.
  5. 2016 Paris Climate Agreement.
  6. 2009 Federal Energy Saving Standards.

7. Factory Mutual.
8. Building Official and Code Administrators.
9. National Electrical Code.
10. American Gas Association Labs.
11. Occupational Safety and Health Act.
12. National Electrical Manufacturers Association.
13. Americans with Disabilities Act.
14. American National Standards Institute.
15. American Society of Mechanical Engineers.

#### 1.11 SUBMITTALS

- A. Kitchen equipment contractor shall review rough-in drawings provided and notify the Architect, Consultant and Construction Manager or General Contractor in writing within 15 days of any utility changes required for the equipment. Submit in thirty days dimensioned drawings showing all Kitchen Equipment items with itemized schedules, mechanical rough-in, electrical rough-in and critical conditions plan.
- B. Submit in thirty days dimensioned drawings showing complete construction details of all fabricated equipment.
- C. Submit in thirty days brochures of regularly manufactured items with project label, project cover sheet, item cover sheet, and specification sheet.
- D. Submit number and type drawings as requested by the owner, architect, consultant and general contractor.
- E. Submit in thirty days material samples with manufacturer's name plate and item number for review to the Owner, Architect, Consultant and Construction Manager or General Contractor.
- F. Submit prior to kitchen equipment demonstration operation/instruction manuals with item cover sheet (indicate on item cover sheet for the kitchen equipment, make, model number, serial number and local service agency with address and phone number for the project location) and copy of manufacturer's operation and instruction manual.
- G. Provide pictures of completed punch list deficiencies to Contractor, Architect Owner and Consultant for review after all punch list work has been completed.

#### 1.12 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver any Kitchen Equipment to the project until advised and building is weather and vandal safe.

#### 1.13 JOB CONDITIONS

- A. Before ordering Kitchen Equipment and starting work verify measurements at job site. Be responsible for fitting Kitchen Equipment into space provided. No extra charge or compensation will be allowed for minimal difference between dimensions indicated and actual field dimensions.

- B. Verify that Kitchen Equipment will fit through openings provided.
- C. Prior to ordering Kitchen Equipment verify all mechanical and electrical utilities available at the project site and coordinate.

#### 1.14 SCHEDULING

- A. Coordinate and schedule delivery and installation of Kitchen Equipment so as not to impede project construction schedule. Coordinate number of days required for equipment installation with owner and general contractor.

### PART 2 – PRODUCT

#### 2.1 MATERIALS

- A. United States standard gauge 18-8, type 302, not over .012% maximum carbon stainless steel with a number 4 finish.
- B. Armco Galvanized Steel.

#### 2.2 MANUFACTURED EQUIPMENT

- A. Standard finishes and accessories unless specifically deleted. Options shall be by same manufacturer.
- B. Follow the manufactures installation instructions.
- C. All equipment for high altitude operation, elevation approximately 7200 feet above sea level as required.

#### 2.3 FABRICATION

##### A. General

1. Provide fabricated Kitchen Equipment as specified.
2. Fabricated by one manufacture with consistent construction for like items.
3. Grind all welds of stainless steel smooth and polish to a number 4 finish.
4. Use concealed type bolts to fasten trim to paneling and body of equipment, and secure to exposed sheet metal surface.
5. Use stainless steel bolts and screws.
6. Where threads of bolts and screws occur on inside of fixtures, are visible, or might come in contact with a wiping cloth, cover screw with washer and stainless steel acorn nut.
7. Do not use rivets to fasten body paneling together.

##### B. Sound deadening

1. Provide Schnee Butyl-Sealant ½" wide rope as a sound deadening material between all metal surfaces and tighten bolts for maximum compression of sealant.

#### C. Painting

1. Non-stainless steel finishes painted two coats of hammer tone gray, air-dried.
2. Oven baked finishes for 2 hours at a minimum temperature of 300° F.

#### D. Stainless Steel Tops

1. 14 gauge stainless steel tops with one piece fully welded construction. Free edges turned down 2" and back on slight angle ½" with corners fully welded, ½" high marine edge with fully welded corners or as detailed, indicated and specified.
2. Where tops fit adjacent to equipment, walls and columns cove up to specified height and back on 45° angle or as specified forming a back splash and Zee clip to wall, unexposed. Enclose ends of back splashes, extending full length of fixture including rolls.
3. Reinforce underside of tops with fully welded 14 gauge stainless steel angle and channel framework of suitable size and at locations as required to hold top flat and support heavy loads without deflection. Provide two hat channels to support drawer assemblies, enclosed bases and leg/gusset as required.
4. Provide cross members at 30" on centers maximum. No bolts or pop rivets in tops.

#### E. Field Joints

1. Fully weld grind smooth and polish to a number 4 finish. Field joints in bases pull tight and cover with pilaster of same material as base. Minimum field joints required for access into building.

#### F. Coved Corners

1. Vertical and horizontal corners coved on a ¾" radius and cove at intersections.

#### G. Enclosed Bases

1. 18 gauge stainless steel formed flat approximately 1" on bottom then formed up to the underside of the top then formed flat approximately 1" to the inside of the cabinet and formed down approximately ½" to create a rigid structure with all seams fully welded, ground smooth and polished. Front rails, mullions, and other components to provide appearance of one piece construction fully welded seamless with no open cracks or ledges.
2. 18 gauge stainless steel U channel filler behind mullions weld in place grind smooth and polish.

#### H. Legs & Cross rails

1. 1 5/8" outside diameter, 16 gauge stainless steel tubing, fully welded at cross rails, ground smooth, and polished.
2. Fit leg with adjustable stainless steel bullet or flange foot with holes secured to floor with non corrosive anchors.
3. Open base legs fit at top with stainless steel gusset welded 360 degrees to underbracing.

#### I. Under shelves

1. 18 gauge stainless steel shelves in enclosed bases, turn rear and ends up with a hug edge, fully weld corners grind smooth and polish. Flush shelf with base fully weld, grind smooth and polish.
2. 18 gauge stainless steel shelves in open based, free sides turn down 2" and back ½ ", at wall or tall equipment turn up 2" with corners notched and fully welded to legs, grind smooth and polish.

J. Casters

1. NSF, 5" diameter, polyurethane, all swivel, top operated foot brake, zerk grease fitting, and to support 300 pound load.

K. Drawers

1. Component Hardware S90-0020\*M126 with four sided 14 gauge stainless steel frame fully welded corners, flange top in, and bolt to hat channels. S90-0015\*M126 for smaller spaces.
2. Provide cylinder locks when specified in itemized specifications, all keyed alike.

L. Sinks and Drain boards

1. 14 gauge stainless steel fully welded construction with all corners covered on ¾" radius.
2. Double wall partitions between sink compartments.
3. Slope drain boards to sink compartment.
4. Crease bottom of sink for proper drainage.
5. Drain boards constructed integral with sink compartments.
6. Fisher 22411\*M126 drain with 14 gauge stainless steel bracket.
7. T & S B-231\*M126 faucet.

M. Over Shelves

1. 18 gauge stainless steel fully welded construction, form as specified for tops, provide stainless steel underbracing as required to support shelf without deflection turn up 2" at wall and equipment.
2. Table mounted shelves mounted on 1" tubing, 16 gauge stainless steel tubing fully welded to top or back splash.
3. Wall mount shelves on 14 gauge stainless steel brackets attached to wall with stainless steel screws.

## 2.4 SCHEDULE OF EQUIPMENT

A. All new kitchen equipment items Kitchen Equipment Contractor shall provide:

1. All items with standard features unless specifically modified or deleted.
2. Assembly and installation according to the manufacture's instructions.
3. Onsite supervision and coordination for all the Kitchen Equipment utility connections.



4. Startup, testing and calibration by the manufacture's authorized service agencies.
5. Onsite demonstration by the manufacture's representative.
6. All items shall have a one year onsite parts, service and labor warranty.
7. Five year compressor warranty for items with a refrigeration system.
8. Refrigerant(s) and refrigeration system(s) shall comply with all current local, state, national and federal government energy efficiency and energy saving standards.

B. Item 1, 1A, 1B and 2, 2A, 2B - Walk in cooler / freezer and refrigeration systems - one required

1. Thermo-kool Industries.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
  - a. THE BUILDING RECESS OR FLOOR MUST BE LEVELED BY THE KITCHEN EQUIPMENT CONTRACTOR OR WALK IN INSTALLER WITH SELF LEVELING CONCRETE FAILURE TO PROPERLY LEVEL THE AREA WILL VOID THE WALK IN MANUFACTURERS WARRANTY.
  - b. SILICONE MAY NOT BE USED INSIDE THE WALK IN TO SEAL INTERNAL SEAMS.
  - c. After complete installation, (including electrical conduits, drains and refrigeration piping and all air tight sealing) prior to refrigeration system start up, Kitchen Equipment Contractor shall blower door test the walk in compartments for ambient air infiltration according to all standards and methods specified in the current ATTMA TSL2 (The Air Tightness Testing and Measuring Association TSL2) for non dwellings. Compartment(s) shall meet or exceed the air leakage standards between normal 0.35 and best practice 0.20 for walk ins (cold stores). Temporarily seal air tight drains, pressure relief ports, etc. Test seams, penetrations, etc. for air leaks with a hand held fog generator, mark any air leaks with non staining bright peel off tape, repair any air leaks found with the fog generator, this may require disassembly, resealing and reassembly. Retest for air leaks until none are detected during the fog test. Test administrator, methods, procedures, testing equipment, written reports and include copy of testing equipment printouts shall be provided according to ATTMA TSL2. Test administrator shall be factory trained, certified and licensed. Testing equipment shall be calibrated before testing. Door opening(s) larger than 34" x 76" will require the Kitchen Equipment Contractor to temporarily reduce the size of the opening with a enclosure that is compatible with the testing equipment and that can withstand the pressure generated during the test. One year onsite parts, service, labor and air leak warranty.
  - d. The walk ins shall be fully installed sixty days before final completion of the project to allow time for testing and refrigeration system start up.
  - e. Kitchen equipment contractor shall start up the refrigeration system(s) fifty days before the end of the project and allow the system(s) to run until the project is turned over to the owner.

Any condensation, water or ice forming inside the walk in will require disassembly, drying out, resealing airtight, reassembly and new blower door testing.

- f. Kitchen equipment contractor shall seal all floor, wall and ceiling panel seams and joints airtight with two (2) continuous 3/8" beads of Kason 3701 butyl sealant apply with a battery operated caulk gun. BUTYL SHALL BE UNEXPOSED, DO NOT APPLY BUTYL TO EXTERIOR.
- g. KITCHEN EQUIPMENT CONTRACTOR SHALL KEEP WALK IN PENETRATIONS TO A MINIMUM.
- h. Kitchen equipment contractor shall furnish and seal airtight all penetrations in the walk in panels for all trades with spray polyurethane insulating foam sealant (rigid or closed cell) the thickness of the panel without any voids, allow sealant to fully cure, trim excess and seal the exposed urethane foam on both sides of the panel watertight with silver NSF food grade 100% silicone sealant. KEC SHALL KEEP WALK IN PENETRATIONS TO A MINIMUM.
- i. Kitchen equipment contractor shall furnish, install, coordinate size and location with the electrician NEMA 4 (non metallic) PVC electrical components, conduits, junction boxes, etc. for walk in panel electrical penetrations. Seal airtight around the outside of the conduit with spray polyurethane insulating foam sealant the thickness of the panel without any voids. Seal airtight inside of the conduit around the wires the thickness of the panel without any voids. KEC SHALL KEEP WALK IN PENETRATIONS TO A MINIMUM.
- j. All electrical components inside the walk in shall be watertight.
- k. Disconnects used inside the walk ins for evaporators fans and evaporator electric defrost heaters shall be NEMA 4 rated.
- l. Kitchen Equipment Contractor shall furnish, install and seal airtight with spray polyurethane insulating foam sealant all penetrations required for the walk ins, KEC SHALL KEEP WALK IN PENETRATIONS TO A MINIMUM.
- m. Kitchen equipment contractor shall provide a Thermo-kool Industries factory trained and certified person onsite to supervise the complete assembly and installation of the walk in system. Provide name of factory trained and certified person in submittal documents for verification.
- n. Kitchen equipment contractor shall level the floor or recess provided for the walk in with self leveling concrete allow to fully cure according to manufactures instructions before installing walk in. SAND IS NOT ALLOWED FOR LEVELING.
- o. NSF certified construction and components. Bear NFS seal.
- p. Non standard size as required to fit the space. Wall and ceiling panels shall be built in 1" increments up to 46" wide. Corner panels shall be 90 degree angle, 12" x 12". All like panels shall be fully interchangeable. Field verify all measurements prior to release for fabrication.
- q. 0.040 embossed aluminum exposed exterior.
- r. 26 gauge stucco embossed galvanized unexposed, exterior.

- s. 0.040 embossed aluminum interior.
- t. Trim openings on sides (at walls) with matching exterior material angles neatly attached with stainless steel screws.
- u. Trim openings on top (at free sides) with matching exterior material, lift off, removable, enclosure panels, attach trim with stainless steel screws.
- v. 4" thick zero ozone depleting urethane insulation foamed in place and bonded to interior surfaces of panels. All panels R-32.
- w. The perimeter frame of all panels shall be formed with a rigid structural high density urethane insulation forming tongues and grooves (soft edge foam panel construction is not allowed). Cam locks shall be formed into the perimeter frame for easy assembly and disassembly.
- x. Panels shall be constructed without interior metal, straps or wood.
- y. Insta-Loks cam locks, three per wall, maximum 43" on centers for taller walls. Insta-Loks cam locks in ceiling panels maximum 36" on centers.
- z. 8'-6" high above building finished floor, 8'-10" high over all.
  - aa. Set in 4" deep recess in building floor.
  - bb. Exterior walk in walls shall be installed 2" off all building walls.
  - cc. Kitchen equipment contractor shall furnish and install below the walk in floor panels and up all sides of the recess 10 mil polyethylene sheeting with all seams sealed watertight with tape.
  - dd. Floor foamed in place 1/8" diamond thread aluminum floor with 3/4" plywood and structural support.
  - ee. 36" wide X 78" high doors with 14" x 24" view port and heated, triple pane safety glass, each door.
  - ff. 14 gauge stainless steel thresholds.
  - gg. Thermostatically controlled heated door jamb and threshold for cooler and freezer doors.
  - hh. Kason 1238C chrome polished latch (handle) with cylinder lock and interior glow in the dark twist off safety release, each door.
  - ii. Kason 1094 chrome polished hydraulic closer, each door.
  - jj. One Kason 1830, 120/1, heated pressure relief port in the wall between the cooler and freezer.
  - kk. One Kason 1830, 120/1, heated pressure relief port in the cooler door panel.
  - ll. Two Kason 1346 chrome polished performer adjustable spring loaded hinges, each door.
  - mm. Kason Thermalflex vinyl strip door curtains, each door.

- nn. Flush mounted 4700HL multi monitor(s) with built in battery back up or equal, PC connect kit, flush mounted MD-1 motion detectors, flush mounted IP-1 illuminated push button panic switches and MC-1 magnetic door contacts pre wired into each door panel.
- oo. Kason 1806 LED lights with frosted high impact lexan globe and LED bulbs centered over each door.
- pp. Eiko VTS-5CS-40K-U (09712) 48" led light with 50,000 life hours, 120-277/1, 40 watts, 5200 lumen. Kitchen Equipment Contractor shall secure fixtures to the ceiling, unexposed, with stainless steel hardware. DO NOT PENETRATE EXTERIOR OF WALK IN CEILING PANELS TO INSTALL FIXTURES. Two in cooler and two in freezer.
- qq. KE2 Therm Solutions evap OEM controllers with recessed basic displays for all evaporator coils. KE2 electronic expansion valves for all evaporator coils. 8 port switch. EM plus wireless router. Cat5e data cables. Set up to KE2 smart access program with computers and devices. Complete installation/set up and fully operational wireless remote temperature motoring system.
- rr. Refrigerant(s) and refrigeration system(s) shall comply with all current local, state, national and federal government energy efficiency and energy saving standards.
- ss. R448A refrigerant for both refrigeration systems.
- tt. 1 horse power (8,885 btu) and sized to maintain +35 degree temperature, pre wired preassembled remote cooler condensing unit, 208/3 with outside weatherproof cover, expansion valve, dryer, sight glass, temperature control, pump down solenoid valve, pressure control, suction line vibration eliminator, coil mounting kit, crankcase heater, headmaster valve, etc. Evaporator coil, 120/1. Thermokool HTPG or equal by Refrigeration Design Texas. Coldzone refrigeration systems WILL NOT be accepted. 105 degree ambient.
- uu. 3½ horse power (10,420 btu) and sized to maintain -10 degree temperature, pre wired preassembled remote freezer condensing unit, 208/3 with outside weatherproof cover, expansion valve, dryer, sight glass, temperature control, pump down solenoid valve, freezer time clock (when required), pressure control, suction line vibration eliminator, coil mounting kit, crankcase heater, headmaster valve, etc.. Evaporator coil, 208/1, drain line heat tape. Thermokool HTPG or equal by Refrigeration Design Texas. Coldzone refrigeration systems WILL NOT be accepted. 105 degree ambient.
- vv. Kitchen equipment contractor shall furnish and install copper refrigeration lines from evaporator coils to condenser properly sized for length of run, suction lines insulated with 1" UV rated arma flex, liquid lines insulated with ½" UV rated arma flex, seal all arma flex seams water tight. Seal all building penetrations for lines air tight with spray foam insulation.
- ww. Support refrigeration lines from structure and run refrigeration lines in chase(s) from condenser to evaporator coil.
- xx. 14 gauge removable U shaped stainless steel trim to cover refrigeration lines.
- yy. Refrigeration lines shall be wrapped with white Speedline or equal 0.020 mil. UV rated cut and curl PVC jacketing with SSL self seal lap with all seams sealed water tight with PVC liquid adhesive.

- zz. Refrigerant(s) and refrigeration system(s) shall comply with all current local, state, national and federal government energy efficiency and energy saving standards.
- aaa. Electrical contractor to furnish and install NEMA 4 electrical disconnect for the cooler and or freezer evaporator coil fans and in the freezer a NEMA 4 electrical disconnect for the evaporator coil defrost heater.
- bbb. Kitchen equipment contractor shall hang evaporator coils with nylon (only non metallic) all thread rod and stainless steel nuts and washers, seal penetrations air tight.
- ccc. Raychem H622, 208/1 (H612, 120/1), wet location winter guard self regulating drain line heat tape(s) with connection kits and H912 gel fill end seal kits. One piece tape with no tees or splices. Heat tape of sufficient length and installed to prevent freezing of walk in drain pipes.
- ddd. Set condensers air intake side 48" minimum from walls, etc. and 48" minimum exhaust side from walls, etc. Set ends 36" minimum from other condensers, walls, etc. Do not set condensers in the exhaust path of any other heat generating equipment.
- eee. Fabricated 24" high fully welded stainless steel rack or wall mounting frame for each condensing to set on with 14 gauge stainless steel solid top, 12 gauge stainless steel angle channels and legs with tabs at bottom for securing rack to mounting location with non corrosive anchors at each corner.
- fff. If roof/curb mounted condensers set units on 25 year ground contact treated 4" x 4" runners. Secure condenser frame to rack or 4" x 4" runners with non corrosive anchors at four corners.
- ggg. Provide a layer of Duro-last DL-40 vinyl 40 mil material between the roof and the 4" x 4" runners when the 4" x 4" runners set on the building roof.
- hhh. Kitchen equipment contractor shall furnish and install 3/4" hard copper drain lines from evaporator coils to floor drain, slope 1/2" to 12" minimum, fully insulated with 3/4" arma-flex insulation, provide clean out tees with plugs and P traps to prevent the back flow of air into freezer from the cooler, or exterior, and from the kitchen into the cooler. Drain pipe to exit the walk in approximately 12" above finished floor, seal penetrations air tight.
- iii. Provide all components required for the complete and proper operation of the walk-in cooler and freezer for the location, region, climate, altitude, etc. of the installation.
- jjj. 3/16" diamond thread aluminum kick plate 36" high on interior and exterior of each door.
- kkk. 3/16" diamond thread aluminum kick plate 36" high on interior and exterior of the door panels, notch above floor base material as required.
- lll. 3/16" diamond thread aluminum kick plate 36" high at exposed exterior, stop kick plate 4" from building walls to allow space for installation of angle trim.
- mmm. The walk in and refrigeration systems shall be set in the location shown on the kitchen plans. The kitchen equipment contractor will be required to disassemble, move and reinstall the walk-in and refrigeration systems if not set how and where shown.

- nnn. Internal and or external structure and all hardware required to support, fully assemble and install walk in the location shown on the plans.
- ooo. Kitchen equipment contractor shall provide and seal air tight all penetrations in the walk in panels for all trades, verify and coordinate.
- ppp. Kitchen equipment contractor shall fully insulate all fire sprinkler pipes as required to prevent condensation, water and ice and from forming on the pipe and dripping inside and or on to the exterior top of the walk in.
- qqq. Kitchen equipment contractor shall furnish, install, coordinate size and location with the electrician of NEMA 4 PVC (only non metallic) electrical components for walk in panel electrical penetrations. Seal around the outside of the conduit airtight. Seal airtight inside of conduit around wires 4" thick from one side of the panel to the other.
- rrr. KEC KEEP WALK IN PENETRATIONS TO A MINIMUM.
- sss. All electrical components inside the walk in shall be watertight.
- ttt. Preassemble walk in at factory for a complete quality control inspection.
- uuu. Refrigerant(s) and refrigeration system(s) shall comply with all current local, state, national and federal government energy efficiency and energy saving standards.
- vvv. All standard features unless specifically modified or deleted.
- www. Kitchen equipment contractor personnel shall be onsite during all kitchen equipment ductwork, plumbing and electrical final connections.
- xxx. Assembly and installation according to the manufacture's instructions.
- yyy. Startup, testing and or calibration by the manufacture's service agency.
- zzz. Onsite demonstration by the manufacture's representative.
- aaaa. One year onsite parts, service and labor warranty.
- bbbb. Extended manufacture's warranties offered at no charge.
- cccc. Five year manufacture's compressor warranty.

C. Item 3 – Walk in shelving – ten required

1. Metro metroseal 3, super erecta.
2. Provide the following:
  - a. Four units with four 21" x 60" wire shelves and four 63" high post, each unit by the evaporator coils.
  - b. Four units with five 21" x 60" wire shelves and four 74" high post, each unit.
  - c. Two New age 2020 18" x 36" x 12" aluminum dunnage rack.

- d. Field verify space and adjust sizes to fit as required.
- e. Assemble onsite verify and coordinate shelf spacing with owner.

D. Item 4 – Dry storage shelving – five required

- 1. Metro metroseal 3, super erecta.
- 2. Provide the following:
  - a. Two units with five 21" x 42" wire shelves and four 74" high post, each unit.
  - b. One unit with five 21" x 48" wire shelves and four 74" high post.
  - c. One unit with five 21" x 72" wire shelves and four 74" high post.
  - d. One New Age 1250CK aluminum can rack.
  - e. Field verify space and adjust sizes to fit as required.
  - f. Assemble onsite verify and coordinate shelf spacing with owner.

E. Item 5 – Not used

F. Item 6 – Not used

G. Item 7 – Preparation table with sinks – one required

- 1. Fabricated according to details, drawings and specifications.
- 2. Provide the following:
  - a. 14 gauge stainless steel one piece covered corner top.
  - b. Marine edge where shown 35 1/2" to top.
  - c. 36" high to top of marine edge.
  - d. 8" high splash at walls from top of marine edge, 8 1/2" high from top.
  - e. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 1/2" and back 1/2" on a slight angle and turn up 2" at walls.
  - f. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
  - g. Copper flashed weld studs capped with stainless steel acorn nuts.
  - h. 3/4" tacky tape between all metal surfaces, installed to create a vermin proof seal.

- i. Stainless steel gussets fully welded 360 degrees to channels.
- j. 1 5/8" 16 gauge stainless steel tubing legs.
- k. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
- l. Stainless steel adjustable bullet feet.
- m. Stainless steel flanged feet at front corners with two holes, secure to floor with two non corrosive anchors.
- n. Weld in partition between bowls SPLIT BOWLS NOT allowed.
- o. Two 18" X 20" X 10" deep 14 gauge stainless steel coved corner sinks.
- p. One T & S B-0184-CR faucet.
- q. Fisher 22411\*M126 lever handle drain(s) with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8" maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
- r. 16 gauge stainless steel overshef with 14 gauge stainless steel wall brackets secure to wall with stainless steel screws, 2" X 3/16" stainless steel band full length fully weld to brackets with stainless steel single sided pot hooks 8" on centers. Free sides turned down 1 1/2" and back 1/2" on a slight angle and turn up 2" at walls. Mount 60" above finished floor (66" at pot sink/dishtable), coordinate height with faucet and owner.
- s. Modify length of overshef to allow space for table top equipment.
- t. Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer. DO NOT OMIT OR DELETE ANY CHANNELS.
- u. 14 gauge stainless steel bracket secured to the underside of the table top for mounting the water filter in a accessible location. Lower the top of the water filter pressure gauge to below the table top height, 34" above the floor, to prevent it getting knocked off by a worker.
- v. 14 gauge stainless steel L shaped bracket secured to the underside of the table top to hold the front of the ice maker 2" past the front edge of the top.
- w. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- x. Z clip splash to wall, unexposed.
- y. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- z. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

H. Item 8 – Table – one required



1. Fabricated according to details, drawings and specifications.
2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 36" high to top.
  - c. Top turned down 1½" and back ½" on a slight angle on all free sides.
  - d. Copper flashed weld studs capped with stainless steel acorn nuts.
  - e. ¾" tacky tape between all metal surfaces, installed to create a vermin proof seal.
  - f. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.
  - g. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME
  - h. Stainless steel gussets fully welded 360 degrees to channels.
  - i. 1 5/8" 16 gauge stainless steel tubing legs.
  - j. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded to legs.
  - k. Stainless steel adjustable bullet feet.
  - l. Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer. DO NOT OMIT OR DELETE ANY CHANNELS.
  - m. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
  - n. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
  - o. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

I. Item 9 – Cook's table – one required

1. Fabricated according to details, drawings and specifications.
2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 36" high to top.
  - c. Top turned down 1½" and back ½" on a slight angle on all free sides.
  - d. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.

- e. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
- f. Copper flashed weld studs capped with stainless steel acorn nuts.
- g.  $\frac{3}{4}$ " tacky tape between all metal surfaces installed without gaps for a vermin proof seal.
- h. Stainless steel gussets fully welded 360 degrees to channels.
- i. 1 5/8" 16 gauge stainless steel tubing legs.
- j. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
- k. Stainless steel adjustable bullet feet.
- l. 2" X 1/4" stainless steel three band fully welded pot rack mounted on 1 5/8" stainless steel tubing supports (7'-6" high) secured to undershelf with stainless steel hardware, penetrate top with stainless steel gusset inverted and fully welded to top and stainless steel double sided pot hooks 8" on center, 16 gauge stainless steel adjustable overshelf with 14 gauge stainless steel brackets fully welded to sockets, mounted on 5" stainless steel sockets with set screws, free sides turned down 1 1/2" and back 1/2" on a slight angle.
- m. Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer, one each unit. DO NOT OMIT OR DELETE ANY CHANNELS.
- n. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- o. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- p. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

J. Item 10 – Baker's table – one required

- 1. Fabricated according to details, drawings and specifications.
- 2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 36" high to top.
  - c. 14 gauge stainless steel removable cap at rear of splash full length with 14 gauge stainless steel full length internal hat channel to support the cap.  $\frac{3}{4}$ " hem at bottom of cap.
  - d. Top turned down 1 1/2" and back 1/2" on a slight angle on all free sides.
  - e. 8" high splash at walls.
  - f. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
  - g. Copper flashed weld studs capped with stainless steel acorn nuts.

- h.  $\frac{3}{4}$ " tacky tape between all metal surfaces, installed to create a vermin proof seal.
- i. Stainless steel gussets fully welded 360 degrees to channels.
- j. 1 5/8" 16 gauge stainless steel tubing legs.
- k. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
- l. Stainless steel adjustable bullet feet.
- m. Three Rubbermaid FG360288WHT3 bins or equal by Cambro.
- n. Two Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer. DO NOT OMIT OR DELETE ANY CHANNELS.
- o. 16 gauge stainless steel overshef with 14 gauge stainless steel wall brackets secure to wall with stainless steel screws, 2" X 3/16" stainless steel band full length fully weld to brackets with stainless steel single sided pot hooks 8" on centers. Free sides turned down 1 1/2" and back 1/2" on a slight angle and turn up 2" at walls/rear. Mount 60" above finished floor (66" at pot sink/dishtable), coordinate height with faucet and owner.
- p. Rear "seamless" over shelf shall have a tight hem and turn down 3 1/2" to enclose rear, form bottom with a tight hem or form same as front and ends
- q. Z clip splash to walls, unexposed.
- r. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- s. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- t. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

K. Item 11 – Table – one required

- 1. Fabricated according to details, drawings and specifications.
- 2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 36" high to top.
  - c. Top turned down 1 1/2" and back 1/2" on a slight angle on all free sides.
  - d. 18 gauge stainless steel undershef where space allows notched and fully welded to legs. Free sides turned down 1 1/2" and back 1/2" on a slight angle and turn up 2" at walls.
  - e. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
  - f. Copper flashed weld studs capped with stainless steel acorn nuts.

- g. 3/4" tacky tape between all metal surfaces installed without gaps for a vermin proof seal.
- h. Stainless steel gussets fully welded 360 degrees to channels.
- i. 1 5/8" 16 gauge stainless steel tubing legs.
- j. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
- k. Stainless steel adjustable bullet feet.
- l. Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer. DO NOT OMIT OR DELETE ANY CHANNELS.
- m. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- n. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- o. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

L. Item 12 – Prep table – one required

- 1. Fabricated according to details, drawings and specifications.
- 2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 36" high to top.
  - c. Top turned down 1 1/2" and back 1/2" on a slight angle on all free sides.
  - d. Copper flashed weld studs capped with stainless steel acorn nuts.
  - e. 3/4" tacky tape between all metal surfaces, installed to create a vermin proof seal.
  - f. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 1/2" and back 1/2" on a slight angle and turn up 2" at walls.
  - g. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME
  - h. Stainless steel gussets fully welded 360 degrees to channels.
  - i. 1 5/8" 16 gauge stainless steel tubing legs.
  - j. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded to legs.
  - k. Stainless steel adjustable bullet feet.
  - l. Component Hardware S90-0015-N drawer with 14 gauge stainless steel four sided fully welded seamless frame. Install with stainless steel screws. Frame is removable from channels and drawer. DO NOT OMIT OR DELETE ANY CHANNELS.

- m. Channels shall be welded to each other with a 1"x1"x4"x1"x1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- n. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- o. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

M. Item 13 – Bun pan rack – one required

- 1. New age 1650.

N. Item 14 – Not used

O. Item 15 – Hot water dispenser – one required

- 1. Bunn o matic H5X 43600.0002.
- 2. Provide the following:
  - a. 208/1.

P. Item 16 – 8 quart mixer – one required

- 1. Kitchen Aid Commercial KSMC895WH, white.
- 2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. 8 quart stainless steel bowl with J handle, stainless steel spiral dough hook, stainless steel flat beater and stainless steel wire elliptical whisk (all standard features).

Q. Item 17 – 20 quart mixer – one required

- 1. Hobart HL200.
- 2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. 20 quart stainless steel bowl.
  - c. 20 quart B beater.
  - d. 20 quart D wire whip.
  - e. 20 quart ED dough hook.

- f. Ingredient chute.
- g. Rubber foot pads.
- h. Piper MX-29-TSS with MX-52-R accessories rack or equal custom fabricated.

R. Item 18 – Silcer – one required

- 1. Hobart Edge12.
- 2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. New age 98000 stand.

S. Item 19 – Shelf – one required

- 1. Metro MetroMax4.
- 2. Provide the following:
  - a. Open grid mats.
  - b. One unit with four 24” x 48” shelves four 63” post, each unit.
  - c. Four 5PCB casters with brakes and 3” donut bumpers, each unit.
  - d. One 48” XDRIP kit.

T. Item 20 – Food processor – one required

- 1. Robot Coup R 2 dice ultra.
- 2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. Standard slicing disc, grating disc and dicing kit.

U. Item 21 – Can opener – one required

- 1. Edlund 270.
- 2. Provide the following:
  - a. 120/1 with cord and plug.

V. Item 22 – Heater and proofer cabinet – one required

1. Metro C539-CLFC-U.
2. Provide the following:
  - a. 120/1 with cord and plug, 12 amps.

W. Item 23 – Ice maker – one required

1. Scotsman UN1520SA-1.
2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. KUFM24 floor mounting kit, for 34" over all height.
  - c. Cuno ICE120-S water filter mounted where shown below top. Mounted to bracket.
  - d. 14 gauge stainless steel bracket secured to the underside of the table top for mounting the water filter in a accessible location. Lower the top of the water filter pressure gauge to below the table top height, 34" above the floor, to prevent it getting knocked off by a worker.
  - e. 14 gauge stainless steel L shaped bracket secured to the underside of the table top to hold the front of the ice maker 2" beyond the front edge of the top.

X. Item 24 – Not used

Y. Item 25 – Not used

Z. Item 26 – Convection oven – one required

1. Moffat G32D5/2C, double stack.
2. Provide the following:
  - a. Natural gas with pressure regulator.
  - b. 120/1 with cord and plug each section.
  - c. Non marking grease resistant casters two with brakes.
  - d. Omit water connections.
  - e. Two Safe-T-Link HG-4C1/2"-48-SK gas appliance connector kit with double swivel ends. Secure restraining device to the building wall and equipment.
  - f. Krowne 28-200 caster positioning system for rear casters, set in a bed of food grade 100% silicone sealant, secure to floor in four places with anchor kit.

AA. Item 27 – Combi oven – one required

1. Rational, full size, iCombi Pro, double stacked.
2. Provide the following:
  - a. iCombi Pro on top iCombi Pro on bottom, double stacked.
  - b. Full size, 18 x 26 sheet pan sized cooking chamber.
  - c. Six level hinging rack for each section.
  - d. Natural gas, each unit.
  - e. 208/1 with cord and plug, each unit.
  - f. Installation kit, each section.
  - g. One 8” high stainless steel fixed leg kit.
  - h. Six stainless steel wire grid shelves for each oven section.
  - i. Twelve 12” x 20” fry baskets.
  - j. One Vari smoker, do not mount to the door.
  - k. PROVIDED BY THE KITCHEN EQUIPMENT CONTRACTOR IN THE DRAIN PIPES, Two required, 2” diameter Cool Drain Flow, Inc drain water tempering valve sized to reduce drain water to below 140 degrees. Provided by KITCHEN EQUIPMENT CONTRACTOR not provided by plumber or Rational. REQUIRED TO PREVENT PVC DRAIN PIPE FROM MELTING. Two required.
  - l. Water pressure regulator required for proper operation. Provided by KITCHEN EQUIPMENT CONTRACTOR not provided by plumber or Rational.
  - m. Backflow preventer required for proper operation. Provided by KITCHEN EQUIPMENT CONTRACTOR not provided by plumber or Rational.
  - n. Test local water source with free kit provide by Rational. Water quality that does not meet Rational standards may require proper water conditioning at an additional cost.
  - o. Heat shield on control side when less than 14” from open flame, as required.
  - p. Rational certified service agency installation with receiving, delivery, set up and testing and connections, for fully operational units.
  - q. Two additional bucket of 150 active green clean tablets, four total.
  - r. Four hours onsite training with a Rational certified chef.
  - s. Two year onsite parts and labor warranty, each unit.
  - t. Five year steam generator warranty, each unit.

BB. Item 28 – Range – one required



1. Vulcan 24S-4B or equal by US range or Southbend.
2. Provide the following:
  - a. Natural gas with pressure regulator.
  - b. Stainless steel front, sides and high shelf.
  - c. Non marking grease resistant casters two with brakes.
  - d. Safe-T-Link HG-4D3/4"-48-SK\*M126 gas hose kit with quick disconnect and swivel ends. Secure restraining device to wall/equipment. Coordinate gas hose size with equipment.
  - e. Krowne 28-200 caster positioning system for rear casters, set in a bed of food grade 100% silicone sealant, secure to floor in four places with anchor kit.

CC. Item 29 – Braising pan – one required

1. Vulcan VG40 or equal by Cleveland.
2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. Natural gas.
  - c. T & S B-0300-102A-CR hot and cold water faucet with check valves MODIFIED with B-0107 spray valve. 14 gauge stainless steel fabricated faucet bracket mounted where shown. Hook mounted on front of bracket face.
  - d. 14 gauge stainless steel faucet bracket where shown. Dummy hook mounted on front of face of bracket turn back.
  - e. Food strainer for pouring spout.
  - f. Secure flanged feet to floor with non corrosive anchors.

DD. Item 30 – Not used

EE. Item 31 – Not used

FF. Item 32 – Hood – one required

1. Provided and installed by the mechanical contractor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

GG. Item 33 – Fire control system – one required

1. Provided and installed by the mechanical contractor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

HH. Item 34 – Not used

II. Item 35 – Hand sink – three required

1. Provided and installed by plumbing contractor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

JJ. Item 36 – Floor tough with drain water tempering – one required

1. Provided and installed by the plumbing contractor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

KK. Item 37 – Not used

LL. Item 38 – Not used

MM. Item 39 – Heated cabinet – one required

1. Traulsen RHF132WP-FHS.
2. Provide the following:
  - a. 120/208/1.
  - b. Pass thru full height with solid doors.
  - c. Serving side door hinged left.
  - d. Kitchen side door hinged right.
  - e. One door with eight pair of 16 gauge stainless steel universal angle slides with mounting hardware, eight each door, each unit.
  - f. Non marking grease resistant casters two with brakes.

NN. Item 40 – Refrigerated cabinet – one required

1. Traulsen RHT132WPUT-FHS.

2. Provide the following:
  - a. 120/1 with cord and plug.
  - b. Serving side door hinged right.
  - c. Kitchen side door hinged right.
  - d. One door with eight pair of 16 gauge stainless steel universal angle slides with mounting hardware, eight each door, each unit.
  - e. Non marking grease resistant casters two with brakes.

OO. Item 41 - Hot food counter – one required

1. Duke TEHF-60DSS.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
  - a. 208/1 with cord and plug.
  - b. 14 gauge stainless steel top.
  - c. 34" deep.
  - d. 34" high.
  - e. 32" high to tray slide.
  - f. Stainless steel base.
  - g. Full length seamless top and tray slide with line up of counters.
  - h. Seamless top and tray slide by Duke mfg. Kitchen Equipment Contractor shall verify and coordinate with field conditions. If field welding is required provide at no additional cost.
  - i. 900 watt sealed hot food wells with manifold drains and drain valve, each unit.
  - j. Drain valve handle with bracket to extend to face of base on operators side, each unit  
EXPRESSION DRAIN HANDLES.
  - k. Solid tray slide mounted on fold down brackets full length seamless with hot food, cold food and flat top counters (as applies). Notch outside corners 2" x 2".
  - l. TS540 full or self service guard full length with LED lights and 18 gauge stainless steel ends, each unit. Guard glass to 1" off top.
  - m. Non standard laminate color on base front verify color and pattern with Architect.
  - n. Stainless steel legs and adjustable stainless steel feet, each unit.

PP. Item 42 – Food bar – one required

1. Cambro VBR6.
2. Provide the following:
  - a. Two VBRR6 tray rails.
  - b. Two VBRTBL end table.
  - c. Four DIV20 divider bars.
  - d. Twelve DIV12 divider bars.
  - e. Five CBP1220 camchiller.
  - f. VBRCVR6 vinyl cover.
  - g. Color to be selected by Architect and Owner.

QQ. Item 43 – Flat top counter – one required

1. Duke TST-18DSS.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
  - a. 14 gauge stainless steel top.
  - b. 34" deep.
  - c. 34" high.
  - d. 32" high to tray slide.
  - e. Stainless steel base.
  - f. Omit middle undershelf.
  - g. Full length seamless top and tray slide with line up of counters.
  - h. Seamless top and tray slide by Duke mfg. Kitchen Equipment Contractor shall verify and coordinate with field conditions. If field welding is required provide at no additional cost.
  - i. Solid tray slide mounted on fold down brackets full length seamless with hot food, cold food and flat top counters (as applies). Notch outside corners 2" x 2".
  - j. Non standard laminate color on base front verify color and pattern with Architect.
  - k. Stainless steel legs and adjustable stainless steel feet, each unit.
  - l. One Vollrath 97241 silverware dispenser or equal with twelve nylon silverware cylinders.

RR. Item 44 - Milk cooler – one required

1. Provided and installed by vendor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

SS. Item 45 – Cashier's counter – one required

1. Duke TCS-30.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
  - a. 14 gauge stainless steel top.
  - b. 34" high to top.
  - c. 32" high to tray slide.
  - d. Stainless steel base.
  - e. Two Solid tray slide mounted on fold down brackets full length seamless. Notch outside corners 2" x 2".
  - f. Stainless steel drawer with cylinder lock and keys.
  - g. Four 5" diameter polyurethane casters two with brakes.
  - h. Opening in top with plastic grommet for cash register cord and plug.
  - i. Duplex outlet in base with cord and plug.
  - j. Non standard laminate color on base front verify color and pattern with Architect.

TT. Item 46 – Flat top counter – one required

1. Duke TST-88DSS.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
  - a. 14 gauge stainless steel top.
  - b. 34" deep.
  - c. 34" high.
  - d. 32" high to tray slide.
  - e. Stainless steel base.
  - f. Omit middle undershelf.
  - g. Full length seamless top and tray slide with line up of counters.

- h. Seamless top and tray slide by Duke mfg. Kitchen Equipment Contractor shall verify and coordinate with field conditions. If field welding is required provide at no additional cost.
- i. Solid tray slide mounted on fold down brackets full length seamless with hot food, cold food and flat top counters (as applies). Notch outside corners 2" x 2".
- j. TS540\*M126 full or self service guard full length with LED lights and 18 gauge stainless steel ends. Guard glass to 1" off top. Length approximately 62" long verify with bun pans.
- k. Non standard laminate color on base front verify color and pattern with Architect.
- l. Stainless steel legs and adjustable stainless steel feet, each unit.

UU. Item 47 – Omit

VV. Item 48 – Microwave – one required

- 1. Panasonic NE-1054F.

WW. Item 49 – Utility cart – two required

- 1. Rubbermaid 3355-88, platinum.
- 2. Provided the following:
  - a.  $\frac{3}{4}$ " white poly cutting board custom fit the top shelf of cart, each unit.

XX. Item 50 – Crowd control – one lot

- 1. Tensabarrier.
- 2. Provided the following:
  - a. Tensabarrier base and post shall have a satin stainless steel finish.
  - b. Three 889 7'-6" single line tensabarrier post and base with anti tampering and centrifugal braking system. Satin stainless steel finish.
  - c. One 889 single line tensabarrier receiver post and base with anti tampering. Satin stainless steel finish.
  - d. All belt colors as selected by the Owner and Architect from standard options. Belts may be different colors for each unit.

YY. Item 51 – Not used

ZZ. Item 52 – Soiled dishtable – one required

1. Fabricated according to details, drawings and specifications.
2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 3" high with a 1½" diameter semi-roll at free sides.
  - c. 18" high splash at walls. Reduce to 8" through pass thru opening and dishmachine.
  - d. Notch splash for roll up door track, verify and coordinate.
  - e. 14 gauge stainless steel fully welded channels, cap front.
  - f. Copper flashed weld studs capped with stainless steel acorn nuts.
  - g. ¾" tacky tape between all metal surfaces, installed to create a vermin proof seal.
  - h. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.
  - i. 21" X 21" X 5" deep 14 gauge stainless steel coved corner pre-rinse sink with removable perforated 16 gauge stainless steel scrap basket and 1" round stainless steel tubing rack runners fully welded to basket.
  - j. Marine edge at pass through opening extending 2" in to dining room, close both ends (at top and bottom) and 4" face to cover sill opening. 14 gauge stainless steel trim in dishroom and channel to support top. Watertight at top on students side.
  - k. T & S B-0133-CR-B08C pre rinse faucet with ceramic cartridges and riser support secured to wall with stainless steel screws.
  - l. Fisher 30376 basket drain.
  - m. The Drain Strainer 1392 installed below sink.
  - n. Stainless steel gussets fully welded 360 degrees to channels.
  - o. 1 5/8" 16 gauge stainless steel tubing legs.
  - p. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
  - q. Stainless steel adjustable bullet feet.
  - r. Stainless steel adjustable flanged feet with two holes at all front legs secure to floor with two non corrosive anchors.
  - s. 14 gauge stainless steel three piece opening trim top and sides, on cafeteria side trim to have a 2" face with a ½" return back to wall. Kitchen side to be 2" flat to the wall. Bottom of trim to extend down 4" (even with turn down of pass thru). Trim shall be secured to wall opening with counter sunk stainless steel screws and hardware.
  - t. Z clip splash to walls, unexposed.

- u. Channels shall be welded to each other with a 1" x 1" x 4" x 1"x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- v. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
- w. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish

AAA.Item 53 – Scrap collector – one required

1. The Drain Strainer 1392, cost approximately \$1,000.00.

BBB.Item 54 – Dishmachine - one required

1. Hobart AM16VLT-ADV.
2. Provide the following:
  - a. 208/3.
  - b. Single point electrical connection.
  - c. Built in, 70 degree rise booster heater.
  - d. Hot water Rapid fill kit.
  - e. Drain water tempering kit factory installed.
  - f. Electric tank heat.
  - g. Hobart rack with end cut out for washing 18 x 26 bun pans.
  - h. Two combination (flat) racks.
  - i. Four peg racks.
  - j. Water shock absorber kit.
  - k. Brass pressure regulator valve, as required.

CCC. Item 55 – Not used

DDD. Item 56 – Not used

EEE.Item 57 – Clean dishtable – one required

1. Fabricated according to details, drawings and specifications.



2. Provide the following:
  - a. 14 gauge stainless steel one piece coved corner top.
  - b. 3" high with a 1½" diameter semi-roll at free sides.
  - c. 18" high splash at walls.
  - d. 14 gauge stainless steel fully welded channels, cap front.
  - e. Copper flashed weld studs capped with stainless steel acorn nuts.
  - f. ¾" tacky tape between all metal surfaces, installed to create a vermin proof seal.
  - g. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.
  - h. Stainless steel gussets fully welded 360 degrees to channels.
  - i. 1 5/8" diameter 16 gauge stainless steel tubing legs.
  - j. 1 5/8" diameter 16 gauge stainless steel crossrails fully welded 360 degrees to legs.
  - k. Stainless steel adjustable bullet feet.
  - l. Stainless steel flanged feet with two holes at all front legs, secure to floor with two non corrosive anchors.
  - m. 16 gauge stainless steel overshelf with 14 gauge stainless steel wall brackets secure to wall with stainless steel screws, 2" X 3/16" stainless steel band full length fully weld to brackets with stainless steel single sided pot hooks 8" on centers. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls. Mount 60" above finished floor (66" at pot sink/dishtable), coordinate height with faucet and owner.
  - n. Channels shall be welded to each other with a 1" x 1" x 4" x 1"x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
  - o. Z clip splash to walls, unexposed.
  - p. Seal all seams and gaps vermin proof with a 100% food grade silicone sealant.
  - q. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

FFF. Item 58 – Pot and pan sink – one required

1. Fabricated according to details, drawings and specifications.
2. Provide the following:
  - a. Integral with clean dishtable top.
  - b. 14 gauge stainless steel one piece coved corner top.
  - c. 3" high with a 1½" diameter semi-roll at free sides.

- d. 14" high splash at walls from top of semi roll (18" from drainboard) (to match 18" high dishtables splash height).
- e. Weld in partition or NO SPLIT BOWLS allowed between bowls.
- f. Three 20" X 26½" X 15" deep (12" deep from top) 14 gauge stainless steel coved corner sinks.
- g. One approximately 21" long 14 gauge stainless steel coved corner integral drainboards.
- h. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and at all walls turn up 2".
- i. 14 gauge stainless steel fully welded channels, cap front.
- j. Copper flashed weld studs capped with stainless steel acorn nuts.
- k. ¾" tacky tape between all metal surfaces, installed to create a vermin proof seal.
- l. Stainless steel gussets fully welded 360 degrees to channels.
- m. 1 5/8" 16 gauge stainless steel tubing legs.
- n. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
- o. Stainless steel adjustable bullet feet.
- p. Stainless steel adjustable flanged feet with two holes at front corners secure to floor with two non corrosive anchors.
- q. One T & S B-231-CR faucet with ceramic cartridges.
- r. One T & S B-0184 faucet with spray hose and ceramic cartridges.
- s. Fisher 22411 lever handle drain(s) with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8" maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
- t. 16 gauge stainless steel overshelf with 14 gauge stainless steel wall brackets secure to wall with stainless steel screws, 2" X 3/16" stainless steel band full length fully weld to brackets with stainless steel single sided pot hooks 8" on centers. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls. Mount 60" above finished floor (66" at pot sink/dishtable), coordinate height with faucet and owner.
- u. Z clip splash to wall, unexposed.
- v. Channels shall be welded to each other with a 1"x1" x 4" x 1"x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical. Center legs 3" maximum from edge of tops, inside of rolls and backsplash surfaces.
- w. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.

GGG. Item 59 – Drying rack – one required

1. Metro MetroMax i PR48VX3-XDR.

## 2.5 ITEMIZED PRICES

1. Bidders that do not provide itemized prices for all specified Kitchen Equipment will be rejected.
2. List prices for alternates to specified items on a separate sheet with specifications.
3. Itemized prices may be submitted in Auto Quotes format or spread sheet.

Equipment Sub total (equipment only no labor) \_\_\_\_\_

State Taxes (equipment only no labor) \_\_\_\_\_

Local/County Taxes \_\_\_\_\_

Bond (when required) \_\_\_\_\_

Installation Labor \_\_\_\_\_

**Total Bid Price** \_\_\_\_\_ **\$** \_\_\_\_\_

## PART 3 – EXECUTION

### 3.1 Installation of Kitchen Equipment

- A. Unload, uncrate, assemble, set-in place, hang, level and adjust Kitchen Equipment. Tag parts shipped loose. Furnish necessary installation instructions. Clean up all trash immediately upon completion of installation and remove from the project site.
- B. Neatly seal gaps of ¼” or less between Kitchen Equipment and walls, other equipment and floors with a “50 year” food grade clear silicone sealant. Seal gaps of ¼” or more with 14 gauge stainless steel trim fully welded ground smooth and polished to No. 4 finish or neatly attach trim with concealed stainless steel bolts and nuts silicon trim to wall.
- C. Erect Kitchen Equipment at project site in full compliance with the codes and regulations of the state and local Health Department.
- D. Remove all protective coatings and other markings from Kitchen Equipment before demonstration. Wash with soap and water, rinse clean and dry spotless.
- E. Provide a competent foreman at the project site to supervise installation of all Kitchen Equipment, and to coordinate with other trades in reference to connections at time of installation. Tag and deliver plumbing and electrical parts, furnished loose and specified as part of the Kitchen Equipment to respective installing trades.

- F. Provide all Zee clips and angles necessary for wall mounting of Kitchen Equipment.
- G. Any sleeves, flanges of anchor bolts required to be built in to building structure to be provided to respective trades.

### 3.2 TESTING, CALIBRATION AND DEMONSTRATION

- A. After completion of final connection by respective trades, test and calibrate Kitchen Equipment for proper operation. Make any necessary adjustments and re-test, repair or replace Kitchen Equipment producing objectionable noise.
- B. Repair finishes marred during handling and installation or replace if required by the owner or consultant.
- C. Schedule demonstration of Kitchen Equipment with manufacturer's representatives, and owner's personnel.
- D. Provide pictures of completed punch list deficiencies to Contractor, Architect Owner and Consultant for review after all punch list work has been completed.

END OF SECTION

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Work Included: Furnish and install stage curtain(s) and equipment specified.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. Use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, and thoroughly familiar with requirements of this work.
- B. Applicable Standards:
  - 1. American Institute of Steel Construction, "Manual of Steel Construction" January 1988, including the "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," November 1978.
  - 2. American Welding Society, "Code for Welding in Building Construction," AWS D1.1-1988.
  - 3. National Fire Protection Association, "National Electrical Code 1987" (NEC Uniform Building Code (UBC) 1988.
  - 4. United States Institute for Theatre Technology (USITT), "Recommended Guidelines for Stage Rigging and Stage Machinery - Specifications and Practices," January 1986.
  - 5. Society of Motion Picture and Television Engineers (SMPTE).

**1.05 PRODUCT HANDLING**

- A. Protection: Protect stage curtain(s) and equipment before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

**1.06 OPERATION AND MAINTENANCE INFORMATION**

- A. Provide two sets of operating and maintenance manuals which contain the following data:
  - 1. Operating instructions for all of the equipment provided.
  - 2. Maintenance information for all of the equipment provided, including a list of all periodic maintenance functions, a list of all equipment with parts identification.
  - 3. "As Built" drawings, showing the equipment as built and installed.

**1.07 WARRANTY**

- A. A warranty covering all labor, materials and workmanship for a period of one year after the date of final payment shall be provided. Any warranty work required shall be completed promptly and in conjunction with the production schedule if the utility of the system is affected to the point of severely affecting performances.
- B. Certification from the original fabric mill supplier shall be provided to verify that all stage drapery fabrics comply with applicable governing codes and guidelines regarding flame resistance.

**PART 2 - PRODUCTS**

**2.01 STAGE DRAPERY**

- A. New stage drapery listed below shall be sewn from inherently flame retardant ("IFR") synthetic face fabric and lined with inherently flame retardant synthetic ("IFR") lining fabric.
- B. Drapery Schedule
  - 1. The drapery shall consist of the following separate pieces:

<u>Quantity</u>	<u>Drapery Item</u>
2 halves	Main Curtain
1 piece	Main Valance
4 pieces	Borders
6 halves	Side Legs
2 halves	Mid Stage Traveller
2 halves	Rear Traveller

- C. Fabrics
  - 1. The stage drapery shall be sewn from the following fabrics:
    - a. Front Setting:
      - 1) Face Fabric: IFR Synthetic Fabric, 26 ounces per yard at 54" wide inherently flame retardant synthetic polyester velour, "prestige" by KM Fabrics of South Carolina, 1224 pile tufts per square inch.

- 2) Lining: IFR Synthetic Line Fabric: 8 ounce inherently flame retardant synthetic fabric, sewn to same fullness as face fabric: "Janus" from Dazian Fabrics of New York or approved equal.
- b. Intermediate and Back Setting:
    - 1) Face Fabric: IFR Synthetic Fabric, 12 ounce inherently flame retardant synthetic "Chevron 2000" by Kreiger & Co. of New York or approved equal.
      - a) Lining: Same as front setting.
- C. Miscellaneous:
1. Provide inserts, cabling, bolts, backing, reinforcements, fasteners, etc. manufacturer's standard units as required. All accessory fabrics to also be inherently flame retardant material in similar manner as face fabric.
    - a. Replace existing light gauge chain and small gauge wire supporting all dead hung sets. Replace with industry standard ¼", Grade 30 chain, applicable properly sized beam clamps which are vibration resistant; forged ¼" anchor shackles and other applicable fasteners.
    - b. All fabrics shall comply with the following minimum guidelines:
      - 1) NFPA 701
- D. Construction
1. All fabric material shall be new and unused. Full and continuous lengths shall be used for the full height of each curtain face, with no piecing or cross-seams allowed. All drapery of the same color shall be constructed of fabric from the same dye lot.
  2. The velour nap shall be sewn in the "up" direction. All curtains shall be sewn with minimum 60% added fullness.
  3. All curtains shall be lined with black fabric, sewn to the same added fullness as the face fabric.
  4. Bi-parting Traveler curtains shall be constructed in two matching halves, sized to allow minimum 36" overlap at the centerline. Side Leg curtains shall be constructed in pairs of two matching halves.
  5. Field dimensions shall be the contractor's responsibility to obtain, to duplicate existing curtain sizes. Guarantee that proper sight lines are taken into consideration.
  6. Lining fabric shall duplicate face fabric type, such that synthetic IFR liner shall complement synthetic IFR face fabric.
- E Top Heading
1. The top edge of each drape shall be sewn flat to 3½" wide heavy duty nylon webbing, constructed with box pleats sewn 12" on centers. No. 2 brass grommets shall be set through the face fabric, lining, and webbing. Each grommet shall be centered in each pleat, with minimum 1" fabric remaining above top edge of grommet.

2. Track-mounted Traveler curtains shall be provided with a plated S-hook at each grommet. Border and leg curtains shall be provided with a 36" length of tie line inserted at each grommet.
- F. Side Hems
1. B-parting Traveller curtains shall include minimum turnback of one half width of face fabric at the onstage leading edge. Offstage vertical edges of full-height traveling curtains shall be minimum 6" of face fabric.
  2. Masking Legs shall include 24" onstage face fabric side hem, and 6" offstage face fabric side hem.
  3. All Lining pieces shall include 2" side hems at both vertical edges.
  4. All Lining pieces shall be attached to the face fabric with 6" x 1" fabric strips, along both vertical side hem edges at 24" intervals.
- G. Bottom Hems
1. All curtains shall include a 6" bottom face fabric him, with an internal canvas chain sleeve sewn into the bottom hem. The internal sleeve shall be attached 2" above the bottom edge of the curtain, with a continuous plated chain weight tacked at each end to prevent bunching.
  2. All Lining pieces shall include 2" bottom hem.
  3. All Lining pieces shall be attached to the face fabric with 6" x 1" fabric strips, along the bottom hem at every strip interval.
- H. IFR Synthetic Face Fabrics
1. Main front setting stage curtains shall be sewn from 21 ounce inherently flame retardant synthetic "Trevira" Velour, such as:
    - a. "Encore" Velour from Milliken & Company of Spartanburg, SC
- I. IFR Synthetic Face Fabrics
1. Midstage and rear setting stage curtains shall be sewn from 12 ounce inherently flame-retardant synthetic fabric, such as:
    - a. "Chevron 2000" fabric from Krieger & Company of Jericho, NY

## **2.02 COUNTERWEIGHT RIGGING EQUIPMENT**

- A. Rope Lock
1. Rope locks shall be a one piece, first grade, grey iron casting, with a once piece cast eccentric hand lever and malleable hardened iron cams. The handle shall be a minimum of 9" long, and shall be covered with colored plastic. The rope lock shall mount to the locking rail with four (4) 3/8" bolts. An oval steel ring to lock the hand lever to the hand line shall be provided. A 3/8" adjusting thumb screw with locking nut shall be provided to permit adjustment for hand lines in the range of 5/8" to 7/8".
  2. Rope Lock shall be the 361 Series as manufactured by Hoffend & Sons, Inc., or approved equal.



B. Manual Handlines

1. 3/4" diameter handlines shall consist of 3-strand composite rope, with cover yarn of polyester filament wrapped around a polyolefin core. The rope shall employ a 3-strand composite construction, combining a polypropylene filament wrapped around a fibrillated polyolefin.
2. The rope shall hold knots well, be easily spliced and be dense enough to allow it to be clamped in a rope lock without damage. The rope shall not be subject to rotting, mildew, or moisture damage nor shall its length be affected by changes in ambient humidity. Tape ends prior to cutting.
3. Attach to Arbor top using bowline knot, and bottom of arbor with two half hitches. Tails shall be secured to the standing line using gaffer's fabric tape.

**2.03 FRONT - SETTING CURTAIN TRACKS**

A. Track

1. Straight curtain tracks: Fabricate of not less than 14- gauge BLACK galvanized roll-formed steel, with each half of track in one continuous piece. Equip track with adjustable, heavy duty guarded pulley as required at track ends.
2. Carriers: Provide BLACK steel ball bearing 1-3/4" solid polyethylene two wheel curtain carriers for track spaced at 12 inch on center.
3. Floor pulley: Provide a BLACK adjustable floor pulley
4. Cord: #12 BLACK stretch-resistant braided polypropylene cord.
5. Bumpers: as required between each carrier.
6. End stops, hang clamps, rope guides, trim chain etc. as required to fully operate system.

B. Track Manufacturers:

1. Automatic Devices Company (ADC)

**2.04 REAR - SETTING CURTAIN TRACKS**

A. Track

1. Straight curtain tracks: Fabricate of not less than 14- gauge BLACK galvanized roll-formed steel, with each half of track in one continuous piece. Equip track with hardware, as required at track ends.
2. Carriers: Provide block constructed plate steel polyethylene two wheel curtain carriers for track spaced at 12 inch on center.
3. End stops, hang clamps, trim chain etc. as required to fully operate the system.
4. Fabricate sides and rear curtain tracks for walk-draw operation.

B. Track Manufacturers:

1. Automatic Devices Company (ADC)

**2.05 RIGGING**

A. Installation

1. Curtain battens: Fabricate battens from BLACK galvanized 1 1/4" steel pipe with a minimum number of joints. Connect pipe with drive-fit sleeve and pin.

2. Track installation: BLACK #2/0 double loop chain secured directly to structures. Crimp all "S" hook ends. Attach other end of chain to track with a turnbuckle. Mouse all turnbuckles to prevent loosening.
3. ALL hardware not factory painted, must be painted with EPOXY BLACK PAINT.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. All stage equipment shall be installed in accordance with the highest standards of the industry. All equipment shall be securely anchored and installed plumb, straight and true. All components shall function properly, safety, quietly and without binding or rubbing.

#### **3.02 FIELD QUALITY CONTROL**

- A. An experienced installation supervisor, regularly employed by the Contractor, shall be present during the entire installation and shall actively direct and supervise the work.
- B. The Contractor shall consult with trades doing related or adjoining work in order to ensure an installation of first class quality.

#### **3.03 DEMONSTRATION AND INSTRUCTION**

- A. Upon completing installation and adjustment for suitable operation of all work specified in this section, the Contractor shall notify the Architect in writing. The Architect will then schedule an inspection. At the time of this inspection, the Contractor shall furnish sufficient tools and workmen to operate all equipment and to perform adjustments and tests as may be required by the Architect. Should any equipment fail to meet the specifications, such equipment shall be repaired or replaced with suitable equipment and an additional inspection will be scheduled. Final approval will be withheld until all systems been thoroughly and completely tested, and found to be in first class operating condition and in compliance with the specifications and drawings.
- B. The Contractor will be responsible for storage of stage curtains, tools and equipment during the period of the installation.
- C. The Contractor shall provide instruction in safe and proper operation of the equipment to the owner's designated representative.
- D. The Contractor shall be responsible for clean-up of debris and garbage which results from installation of stage rigging and drapery equipment.

**END OF SECTION 11 61 43**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide manually-operated roll-up fabric interior window shades, including mounting and operating hardware.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.
- D. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section. If manufacturer does not meet minimum experience requirement, please submit life cycle test data showing minimum 2000 complete operational cycles for each year of warranty showing no failure and that shade remains fit for use as a operable shade.
- B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use. Show complete manufacturer data (name, location, contact) and certification from manufacturer that the fabrics sourced for this project comply with the test data provided.

- C. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.
  - 1. Locate mock-up in window(s) designated by Architect.
  - 2. Do not proceed with remaining work until mock-up is accepted by Architect.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.
- D. Store products in manufacturer's unopened packaging until ready for installation.

#### **1.06 SEQUENCING**

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### **1.07 PROJECT CONDITIONS**

- A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

#### **1.08 WARRANTY**

- A. Manufacturer to warrant its hardware components and shade fabric to be free from defects in material and workmanship under the normal and proper use for a period of twenty-five (25) years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Draper, Inc.. Toll Free Tel: 800-238-7999.
- B. All work regarding shades to be coordinated with Kavanaugh Blind Shade & Shutter Co., 5208 Kavanaugh Blvd, Little Rock, AR, 501-831-3129; email: Brett Todd [sbretttodd@outlook.com](mailto:sbretttodd@outlook.com)

- C. Approved Dealers:
  1. Shop Mr. Blinds, Searcy, AR 501-232-8382, Mandy Lloyd.
  2. Baker Window Coverings, 501-529-2900, Janet Baker
  3. Other equal dealers will be subject to approval by the architect.
  
- D. Approved equal manufacturers:
  1. Hunter Douglas
  2. SWF Contract (Springs Window Fashions)

## **2.02 MANUALLY OPERATED WINDOW SHADES**

- A. Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation.
  1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
    - a. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon. White or Black color as selected by Architect.
    - b. Bead chain loop: Stainless steel bead chain hanging at side of window.
    - c. Idler Assembly: Provide roller idler assembly of molded nylon with adjustable or spring-loaded length idler pin to facilitate easy installation, and removal of shade for service.
    - d. Bead Chain Hold Down: P-Clip (standard).
  2. Mounting:
    - a. Mounting brackets.
    - b. End-caps and fascia.
  3. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
  4. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.
    - a. Endcap covers: To match fascia or headbox color.
  5. Brackets: Plated stamped steel. Provide size compatible with roller size.
    - a. Mounted to jamb.
  6. Shade slat: Slat encased in heat seamed hem.
  7. Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
    - a. Attachment: Snaps onto end-caps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. No notching is required.
    - b. Shape: Square Fascia Panel.
    - c. Finish: Finish: Charcoal powder coat.

## **2.03 FABRIC**

- A. Light-Filtering Fabrics
  - 1. Refer to the Product Schedule located in the drawings for locations, types, patterns and colors.
- B. Room Darkening Fabrics
  - 1. Refer to the Product Schedule located in the drawings for locations, types, patterns and colors.

## **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.

### **3.02 PREPARATION**

- A. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.
- B. Coordinate requirements for blocking, construction of shade pockets, and structural supports to ensure adequate means for installation of window shades.
- C. Coordinate installation of recessed shade pockets with construction of suspended acoustical panel ceilings specified in Section 09 51 00.
- D. Coordinate installation of recessed shade pockets with construction of suspended gypsum board ceilings specified in Section 09 21 16.
- E. Coordinate requirements for power supply conduit, and wiring required for window shade motors and controls.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install roller shades level, plumb, square, and true. Allow proper clearances for window operation hardware.
- C. Shade pockets:
  - 1. Install shade pockets prior to installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches (610 mm) minimum centers.

2. Install shade pockets in conjunction with installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches (610 mm) minimum centers.
  3. Install corner pieces securely and in alignment with pockets.
  4. Install pocket ends securely and in alignment with pockets.
  5. After interior construction is essentially complete, install shade and operating mechanism in pocket.
- D. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
1. Fascias.
  2. Closure panels.
  3. Endcaps.
- E. Install headbox, side channels, and sill channel with sealant specified in Section 07 92 00 - Joint Protection.
- F. Position shades level, plumb, and at proper height relative to adjacent construction. Secure with fasteners recommended by manufacturer.

### **3.04 TESTING AND DEMONSTRATION**

- A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
- B. During daylight hours, lower shades and turn off interior lights. Verify that there are no light leaks at perimeter or within shade assembly. Correct deficiencies.
- C. Demonstrate operation of shades to Owner's designated representatives.

### **3.05 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

### **3.06 SCHEDULES**

- A. Refer to Drawings for shade types and locations.

**END OF SECTION 12 24 13**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Furnishing and assembling of all wood casework, worktops and trim associated with the casework and **not noted to be provided under Division 06.**

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 QUALITY ASSURANCE**

- A. The specifications and drawings define and show the essential minimum requirements. Where a definite material or manufacturer is specified, it is not the intent to discriminate against any product of another manufacturer. However, it is the intent of this specification to provide for the Owner a quality and educationally functional installation of laboratory equipment and casework, and to exclude inadequate or inferior laboratory equipment and casework.
- B. Minimum standards are set forth herein to comply with this intent. Laboratory equipment and casework manufacturer(s)/bidders are cautioned that **ONLY EQUIPMENT MEETING THE STANDARDS SET FORTH IN THE SPECIFICATION WILL BE ACCEPTABLE.**
- C. To insure that all bidders are bidding equal equipment, all requests for changes, modifications, substitutions, approvals, etc., will be set forth in an addendum. Any item not receiving prior approval will rightfully be construed as based on supplying the educational function, essential requirements, design, construction, and materials as called for in this specification. Bidders shall not rely upon approvals made in any other manner.
- D. Cabinet construction and associated components are approved and listed with SEFA to SEFA 8-2010 4TH Edition, Version 1.0 Specification.

## **1.05 RELATED WORK**

- A. Examine Contract Drawings and Project Manual and determine extent of related work including sinks, plumbing, and electrical work performed by others. Rough-in, install and connect equipment under Contract between Owner and General Contractor, installing complete and ready for use with subcontract agreements executed accordingly. No extra payments made for omissions of related work in subcontract agreements affecting this work. Provide holes and cutouts in counter tops from templates furnished by appropriate subcontractors.

## **1.06 MAINTENANCE AND OPERATING INSTRUCTIONS**

- A. This contractor shall include in its bid, the cost of providing a technically qualified representative for a period of one (1) day to thoroughly instruct the Owner's personnel in correct procedures of operating and maintaining this contract.

## **1.07 GUARANTEE**

- A. This contractor shall guarantee all materials and workmanship of equipment provided on this contract for a period of one (1) year from the date of final acceptance. Any defective materials or faulty workmanship occurring within that time shall be replaced or corrected without charge.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. Acceptable Manufacturer: ICI Scientific (previously CampbellRhea), which is located at: 1865 North Market Street, Paris, TN 38242 or approved equal; Tel: 731-642-4251. Email: Request info: [sales@iciscientific.com](mailto:sales@iciscientific.com) ; Web; [www.iciscientific.com](http://www.iciscientific.com)
  - 1. Approved Equal Manufacturer: Sheldon Laboratory Systems, 102 Kirk Street, Crystal Springs, MS, 39059, Tel. 800-531-7604.

### **2.02 MATERIALS (WOOD CASEWORK)**

- A. General:
  - 1. All casework shall be of modern design and shall be constructed in accordance with the best woodworking practices of the cabinet making industry. First class quality casework shall be established by use of machinery, tools, fixtures, and skilled workmanship. Tolerances for components per various equipment used to manufacture components.
- B. Definitions:
  - 1. The following definitions apply to wood laboratory casework units. Casework unit size and type are indicated on the drawings and/or equipment list.

- a. Exposed portions of casework include surfaces visible when doors and drawers are closed. Bottoms of cases more than 4'-0" above floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.
  - b. Unexposed portions of casework shall include sleepers, web frames, dust panels, and other surfaces not usually visible after completed installation.
  - c. Semi exposed portions of casework shall include interior spaces only exposed to view when doors and drawers are open.
- C. Materials: Materials used for construction of cabinets, cases and tables as specified herein shall meet or exceed the minimum standards as specified.
- 1. Wood species required shall be: Maple
  - 2. All wood materials used shall meet applicable standards for CARB 2.
  - 3. Exposed Woods
    - a. Solid Wood: Flat sawn lumber, clear and free from defects. All lumber thoroughly and properly air dried to a uniform moisture content of 4%-6% by weight, tempered to 7%-8% during fabrication.
    - b. Plywood: Plywood shall be thickness as specified herein, faced with surface veneer secured with highly water-resistant glue. Wood veneer shall be plain sliced. Wood veneer shall be "Premium Grade A", face smooth, tight cut and full length of exposed face.
  - 4. Unexposed Woods
    - a. Solid Lumber: Dry, sound, selected to eliminate appearance defects. Any species of hardwood.
    - b. Plywood: Uniform hardwood face veneer.
  - 5. Hardboard: (Tempered) Shall be 1/4" thick. All hardboard shall be composed of wood fibers and resinous binder compressed under heat and pressure.
- D. Construction - General
- 1. Cabinets, cases, tables, and other units shall be of the size and configuration indicated on the drawings and/or equipment list. General construction is bored, doweled, dadoed and glued.
  - 2. Base Cabinet Construction
    - a. Cabinet end panels shall be 3/4" thick, 7-ply, hardwood plywood.
    - b. Vertical partitions (as required) shall be 3/4" thick, 7-ply, hardwood plywood.
    - c. Exposed edges of end panels, bottoms, partitions, shelves shall be edged with 3mm solid wood banding.
    - d. Two Piece Top Frame: 1" X 3" solid hardwood front rail, back grooved to receive cross rails, and similar 1" X 3" solid hardwood back rail, both set flush with cabinet ends; doweled and glued into place.
    - e. Cross rails are 1" X 2-1/4" solid hardwood fully housed into front and back rails with mortised and tenoned joints to form a full four-sided top frame.
    - f. Intermediate rails (as required) are 1" X 3" solid hardwood rails, back grooved to receive security panels as required, set flush with cabinet ends; doweled and glued into place.

- g. Cabinet bottoms shall be 3/4", 7 -ply hardwood plywood. Set flush with cabinet ends; doweled and glued into place.
  - h. Security panel (as required) is 1/4" thick hardboard. Panel is provided between drawers/drawers and drawers/doors when base cabinet has lock sets keyed differently.
3. Wall Cabinet Construction
- a. Cabinet end panels shall be 3/4" thick, 7-ply, hardwood plywood.
  - b. Vertical partitions (as required) shall be 3/4" thick, 7-ply, hardwood plywood.
  - c. Exposed edges of end panels, top and bottom panels, partitions, shelves shall be edged with 3mm solid wood banding.
  - d. Cabinet tops and bottoms shall be 1", 11 -ply hardwood plywood. Set flush with cabinet ends; doweled and glued into place.
  - e. Back panel shall be 1/4" hardwood plywood when cabinet interior is exposed and 1/4" hardboard when semi exposed.
  - f. Top and bottom back rail shall be 1/2" hardwood plywood.
  - g. Each wall case will be provided two heavy duty steel angled mounting brackets screwed to the interior of the cabinet end panels and shall be used for mounting cabinets to wall structure.
4. Tall Cabinet Construction
- a. Cabinet end panels shall be 3/4" thick, 7-ply, hardwood plywood.
  - b. Vertical partitions (as required) shall be 3/4" thick, 7-ply, hardwood plywood.
  - c. Exposed edges of end panels, top and bottom panels, partitions, shelves shall be edged with 3mm solid wood banding.
  - d. Intermediate rails (as required) or back rails are 1" X 3" solid hardwood rails, back grooved to receive security panels as required, set flush with cabinet ends; doweled and glued into place.
  - e. Cabinet bottoms shall be 3/4", 7 -ply hardwood plywood. Set flush with cabinet ends; doweled and glued into place.
  - f. Cabinet tops shall be 1", 11 -ply hardwood plywood. Set flush with cabinet ends; doweled and glued into place.
  - g. Top Back Rail and Center Back Rail shall be 1" X 3" solid hardwood doweled and glued into end panels. Bottom Back Rail shall be 3/4" X 4" hardwood plywood doweled and glued into end panels.
  - h. Back panel shall be 1/4" hardwood plywood when cabinet interior is exposed and 1/4" hardboard when semi exposed.
5. Drawers
- a. Drawer Box Body: Back, sides, and front shall be 1/2" thick 9-ply birch plywood, chuck and bore joinery with 1/4" thick hardboard white melamine bottom. Set in groove all around, pinned and glued, clear chemical resistant finish with 3mm PVC complementing adjacent finish.
6. Doors - Base and Wall Cabinets
- a. Estate front: Shall be 3/4" thick constructed door with 45 lb industrial grade core, 3/4" X 7/8" solid hardwood banding, overlaid with 1/8" solid hardwood veneer, radius all edges. Grain direction is vertical.

7. Doors - Tall Cabinets
  - a. Estate front: Shall be 3/4" thick constructed door with 45 lb industrial grade core, 3/4" X 7/8" solid hardwood banding, overlaid with 1/8" solid hardwood veneer, radius all edges. Grain direction is vertical.
8. Doors - Framed Glass
  - a. Shall be 3/4" X 3" solid hardwood rails, doweled and glued together; sanded for smooth fit and edge detailed to match door selection.
9. Cabinet Backs
  - a. Exposed interior - 1/4" thick hardwood plywood
  - b. Unexposed interior - 1/4" thick hardboard (Removable at sink cabinets)
10. Cabinet Shelves
  - a. Shelves in cabinets shall be 1" thick 11-ply hardwood plywood. Front edge banded with solid hardwood. Shelves are adjustable on 1-1/4" centers, supported by four (4) nickel-plated steel pin and socket type shelf clips.

E. Laboratory Grade Wood Finish

1. Exposed wood parts of all laboratory equipment shall be finished SEFA approved finish. Standard colors or clear finish available
2. All parts shall be carefully sanded and buffed in preparation for the finishing processes. The first coat shall be a stain and sealer coat of synthetic resin. The product is then cured at elevated temperatures. After the first sealer coat, the product shall be sanded, wiped clean and then two (2) more coats of an acid resisting synthetic resin shall be applied and cured at elevated temperatures.
  - a. Interior of cabinets with solid doors receive one (1) sealer coat and one (1) coat of an acid resisting synthetic resin.
3. Cabinet Finish Chemical Test and Evaluation
  - a. All manufacturers proposing to submit a bid must provide certification that their finish will meet the following requirements.
  - b. Chemical Resistance
    - 1) Chemical Reagents - withstand one (1) hour contact with ten (10) drops (1/2 ml.) covered by watch glass, convex side down in center of pool to prevent evaporation.

Formaldehyde, 37%

Nitric Acid, 20%

Sodium Hydroxide, flake

Sodium Sulfide, saturated

Zinc Chloride, saturated

RESULT - No visible effect other than slight discoloration, change of gloss or temporary softening of film.

- 2) Solvents - withstand contact with ten (10) drops (1/2 ml.) placed on surface until evaporated.

Methyl Ethyl Keytone

Gasoline

Chloroform

Xylene

Ethyl Alcohol

Trichloroethylene  
Naphthalene

Acetone  
Toluene

RESULT - No visible effect other than slight discoloration, change of gloss, or temporary softening of film.

- 3) Heat Resistance - Hot water (190-205 degrees) trickled down surface (tilted 45 degrees) for five minutes. No visible effect.
- 4) Moisture Resistance - Cellulose sponge (2" X 3" X 1") soaked with water and placed on finish for 100 hours and kept constantly wet. No effect.
- 5) Fade Resistance - 100 hours exposure to Sylvania 275 R.S. sun lamp placed 10" above surface. Slight discoloration.

### **2.03 CASEWORK HARDWARE AND ACCESSORIES**

- A. Hinges: Institutional type, ground tip, five-knuckle, with pins of not less than .177" in diameter and leaves of not less than .095" thick. Hinges shall be wrought steel with chemical resistant epoxy powder coating. Two (2) hinges shall be provided on doors under 36" in height and three (3) hinges for doors 36" and over.
- B. Pulls: Solid metal, wire type, 4" long mounted with two (2) screws fastened from back. Pulls shall be chemical resistant epoxy powder coated to match hinges. Provide two (2) pulls for drawers over 24" wide.
- C. Drawer Slide System: Full extension drawer runners shall be powder coated, cold roll steel, featuring a captive roller system with in and out stop and out position keeper. Drawer runners shall be side and bottom mount with 100 lb. load rating per BHMA, BIFMA test procedure.
- D. Door Catches: Provide two (2), top and bottom. Dual, self-aligning magnetic catch.
- E. Elbow Catches: Brass with latch held by coiled compressing spring. Catch plates of 16 gauge plated steel.
- F. Slam Latch: Supplied on tall cases with double doors where locks are specified, 4-5/8" bevel slide bolt with 2-1/4 lb./in. actuated spring.
- G. Leg Shoes: Molded vinyl or rubber, black, coved bottom type to match radius of base molding.
- H. Glass: Type I, Class I, Quality q3; .218" thick float.
- I. Locks: Lock is laboratory grade, cylinder cam lock, with 5-disc tumbler mechanism, and a dull chrome-plated face. Tumblers and keys are brass, while plug and cylinder are die cast zinc alloy. Locks are keyed alike on ALL doors and drawers.
- J. Tote Tray - High impact plastic tray with high gloss.

## 2.04 TOPS, SINKS, AND ACCESSORIES

### A. General

1. Comply with physical and chemical resistance requirements for materials for tops and sinks as specified herein.
2. Tops: Provide smooth, clean, exposed tops and edges, in uniform plane free of defects. Splash and curbs shall be 4" high x 1" thick, unless otherwise noted on the drawings, and shall be located at the backs of all counter tops.
  - a. Top sizes: Furnish tops in maximum practicable lengths, in configuration indicated on the drawings.

### B. Counter Tops

1. Epoxy Resin (Durcon) - specially blended to produce a high chemical resistant material. Tops shall be one inch (1") thick. Physical and mechanical properties:

Tensile strength, psi	10,700 PSI
Compressive strength, psi	30,600 PSI
Flexural strength, psi	12,800 PSI
Hardness, Rockwell "M"	105
Density, gr/cc	2.03 G/CC

### C. Sinks, Troughs, and Service Turrets

1. Epoxy Resin - one-piece construction. Sinks to be "drop-in" style with inside corners and bottoms coved for easy cleaning. Epoxy sinks furnished with polypropylene sink outlets.

### D. Laboratory Service Fixtures and Fittings

1. Vandal-Resistant Fittings.

Provide Vandal- Resistant Faucets and Fittings specifically designed to prevent student damage and provide extra protection from student vandalism.

All Service Fittings shall conform to SEFA 7-2010, Recommended Practices for Laboratory Service Fittings, Para 14.0 - 14.3 for Vandal Resistant Fittings.

Each fitting shall resist turning, bending, breakage, and unintended disassembly through acts of vandalism or physical abuse.

#### **Vandal- Resistant Construction features shall include:**

All threaded connections that will not require field service shall be secured with a suitable adhesive so as to be non-removable.

All Goosenecks and spouts shall be constructed of heavy duty pipe or tubing that is sufficient to resist bending and breakage.

Faucet bodies and turret bases shall be provided with locking pins or other means to prevent the fixture from being turned on the work surface.

Outlet fittings (such as aerators or serrated hose ends) shall either be of Vandal-Resistant design or shall be secured in place with an adhesive.

Index buttons shall be tamper-proof.

Water fittings provided with serrated hose ends shall be furnished with vacuum breakers to prevent contamination of the potable water system through backflow or back-siphonage.

Fittings for laboratory gases shall be furnished with ball valves.

Water fittings shall have valve packing nuts secured with set screws. Integral Vacuum Breaker covers shall be secured with screws that may be removed only by maintenance personnel.

2. Gas Fixtures:

Provide gas fittings in multiple service faucets, deck mounted turrets, or panel mounted flanges with ball valve, forged brass lever handle, non-removable serrated hose end, and color coded index button.

Provide ball valve with chrome plated ball and PTFE seals. Handle shall require no more than 5 ft-lbf to operate. Valve is factory tested at 125 PSI. Maximum working pressure is 75 PS.

3. Water Faucets and Valves:

Provide units that comply with SEFA 7 - 2010, Laboratory Service Fittings - Recommended Practices, and also complying with ANSI/ASME A112.18.1 - 2005 and certified by CSA International under CAN/CSA B.125.1 - 05.

Provide units fabricated from cast or forged red brass unless otherwise indicated.

Provide fittings complete with threaded mounting shanks, locknuts, and washers. Include necessary flanges, escutcheons, extension rods, etc.

Provide units complying with ADA accessible requirements where indicated on Drawings or Equipment List.

One Faucet shall be provided with 4" wrist-blade handles at ADA sinks.

All Water faucets shall be provided with Aerators unless specifically noted to have Serrated Hose Ends.

If Serrated Hose Ends are required on Water Faucets, provide unit with Vacuum Breaker.

Water Faucets shall have self-contained renewable compression valve units with stainless steel valve seats. Compression unit valve stem shall be sealed with molded TFE stem packing to prevent leakage. Provide color coded index buttons.



4. Quality Assurance

All water faucets and gas fixtures shall be fully assembled and factory tested prior to shipment.

5. All Water and Gas Service Fixtures shall have Black Powder Coat Epoxy Finish.

6. Multiple Service Water/Gas Fixture Combination Faucets.

Watersaver Faucet Co. No. VR5300WSA (verify with drawings)

- \* Combination Cold Water/Gas Fixture with Aerator
- \* Black powder coat epoxy finish
- \* Color coded Nylon Handles for cold water
- \* Vandal-Resistant

Watersaver Faucet Co. No. VR5800WSA (verify with drawings)

- \* Combination Hot Water/Cold Water/Gas Fixture with Aerator
- \* Black powder coat epoxy finish
- \* Color coded Nylon Handles for hot and cold water
- \* Vandal-Resistant

E. Drain Fittings:

1. Sink Fittings - Sinks shall be provided with 1-1/2" Dia. x 3" threaded Polypropylene Sink Outlet with Locknut, Removable Disc Strainer, and Sink Stopper.

F. Electrical Fixtures:

1. Electrical Fixtures that are a part of, or installed in the Lab Equipment shall be approved by the National Board of Underwriters and must conform to City and State Building Codes.
2. Knock-out Boxes when indicated, shall be installed in the Lab Equipment.
3. Receptacles shall be grounded type, 20-amp heavy-duty industrial grade.

## 2.05 TECHNICAL PRODUCTS

A. General:

1. The following Equipment List is provided to accurately describe specific Technical Products shown on the Drawings and Equipment List:
  - a. Fume Hood: Air Master Corporation "Eliminator 900" #92288 ADA.
  - b. 3/4" upright assembly at each student station
  - c. Safety Center Shower/Eyewash: #66100
  - d. Safety Glasses Cabinet: #31170
  - e. Wood Flammable Storage Cabinet: #SC7131
  - f. Wood Acid Storage Cabinet: #SC8051
  - g. Wall Drying Rack: #79530
  - h. Lab Coat Hooks: #73826

## **PART 3 EXECUTION**

### **3.01 COORDINATION**

The casework contractor shall coordinate all deliveries and installation of this equipment with the General Contractor and associated trades.

- A. Lab casework shall not be delivered to the job site until the following conditions have occurred.
  - 1. Overhead ceiling work - ductwork, lighting, acoustical ceiling, etc. is complete.
  - 2. Windows and exterior doors are installed. Building is secure and weather tight.
  - 3. Air circulation control system is functioning and maintaining relatively constant temperature and humidity conditions closely approximating those to be maintained by the Owner.
  
- B. It is recommended that all painting be completed in the areas in which casework is to be installed prior to such installation.

### **3.02 CABINET INSTALLATION**

- A. The casework shall be delivered to the building in pre-finished modular units. It shall be set in place, leveled, secured to walls or floors as necessary, trimmed or scribed to make a neat installation. Installation shall be under the direction of a factory approved superintendent.
  
- B. Provide filler panels where required to close spaces between casework and walls.
  
- C. The casework contractor shall deliver to the appropriate contractor all sinks, troughs, service fixtures, etc., as supplied in this section, for installation and connection by the appropriate trades.

### **3.03 CLEANING AND PROTECTION**

- A. Remove all debris, dirt, rubbish and excess material accumulated as a result of the installation of this equipment and leave casework clean and orderly.
  
- B. Advise contractor of procedures for protection of installed material from damage from work of other trades.

**END OF SECTION 12 32 13**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Telescopic seating systems comprised of multi-tiered rows of seats, deck components and risers on interconnected, retractable, supporting structure. Telescopic seating operation shall be by means of manual or electric operation. Telescopic seating system shall be wall attached (typically), recessed, telescoping or portable. System shall be floor attached where reverse folding.

**1.02 RELATED DOCUMENTS**

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

**1.03 SUBMITTALS AND SUBSTITUTIONS**

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

**1.04 REFERENCES**

- A. ICC 300 - Standard for Bleachers, Folding and Telescopic Seating and Grandstands.
- B. American Welding society (AWS):
  - 1. AWS D1.1 Structural Welding Code - Steel.
  - 2. AWS D1.3 Structural Welding Code - Sheet Steel.
- C. American Institute of Steel Construction (AISC): AISC - Design of Hot Rolled Steel Structural Members.
- D. American National Standards Institute (ANSI).
- E. American Iron & Steel Institute (AISI): AISI - Design Cold Formed Steel Structural Members.
- F. Aluminum Association (AA): AA - Aluminum Structures, Construction Manual Series.
- G. American Society for Testing Materials (ASTM): ASTM - Standard Specification for Properties of Materials.

- H. National Forest Products Association (NFOPA): NFOPA - National Design Specification for Wood Construction.
- I. Southern Pine Inspection Bureau (SPIB): SPIB - Standard Grading Rules for Southern Pine.
- J. National Bureau of Standards/Products Standard (NBS/PS): PS1 - Construction and Industrial Plywood.
- K. Americans with Disability Act (ADA): ADA - Standards for Accessible Design.
- L. International Building Code (IBC).

## 1.05 MANUFACTURER'S SYSTEM ENGINEERING DESCRIPTION

- A. Manufacturer's Design Criteria
  1. Gymnasium seat assembly is designed to support, in addition to its own weight, a live load in excess of 120 lbs. per linear foot or 100 lbs. per square foot (whichever affect is greater), front to rear sway in excess of 10 lbs. per linear foot and a parallel sway load in excess of 24 lbs. per linear foot of row.
  2. Guard railings are engineered to withstand a load of 200 lbs. per foot at top rail and an intermediate load of 150 lbs. per foot.
  3. Steel structure must be free standing when installed and include 4 steel columns per row, per section. Those manufacturers which only include 2 columns per row, per section are not acceptable.
  4. Steel columns must be fabricated from structural high tensile steel tubing; minimum size of tubing will be 1-1/2" x 3" x 10 ga. Those manufacturers providing formed steel or angle iron columns in place of structural tubing are not acceptable. Maximum spacing between columns shall be 11'-6".
  5. Two row locks per row, per bleacher section manufactured from 1/4" hot rolled steel to prevent racking of bleachers as they are retracting are required.
  6. Footboards shall be produced from 3/4" plywood with top facing. Voids or boat patching on top facing is not acceptable. Top facings shall receive 3 coats of colored, opaque, catalyzed epoxy coating. Aluminum trim shall be installed on all exposed edges. Extruded aluminum joiners shall be placed between adjacent footboards.
  7. Optional Upgrade – Panelam decking on 3/4" plywood.
  8. Optional Upgrade – Bronzed aluminum decking.
  9. Wood seat boards shall be full 4/4" finished size, kiln dried, select pine with rounded edges. Seat boards shall be sealed on all surfaces and three coats of polyurethane on top and sides.
  10. Molded seats shall be 18" wide of high density polyethylene structural foam with full perimeter interlock and concealed mounting hardware. End caps shall be provided at all ends, aisle ways and ADA locations. Colors are bright without excessive streaking. "Waterfall" coloring will not be acceptable. Indents for numbers and letters shall be standard.

11. No less than 4" diameter x 1-1/4" soft faced, non marking rubber wheels to support understructure system shall be provided with sintered metal bearings and clips for easy replacement.
12. Nose beam shall be formed from 14 ga. minimum galvanized steel. Steel shall have G90 galvanized coating or better. These will encapsulate 3/4" plywood decks.
13. Rear riser shall be formed from 14 ga. minimum galvanized steel. Steel shall have G90 galvanized coating or better.
14. Handicap seating provisions: Provide recoverable first tier cutouts as required by ADA. Include manufacturer's standard front guardrail and closure panel below. Shop drawings will reflect locations.
  - a. Provisions for companion seating will be made and indicated on the drawings.

## **1.06 QUALITY ASSURANCE**

- A. Acceptable Manufacturer
  1. The manufacturer shall be a firm experienced in the manufacturing of telescoping bleacher seating systems.
  2. The telescopic seating system specified herein shall comply with the International Code 2000 Edition, Standard for Assembly Seating, Tents and Membrane Structures; and specifically with Chapter 5, Folding and Telescopic Seating, except where additional requirements are indicated or imposed by authorities having such jurisdiction.
  3. The telescopic seating system manufacturer shall employ a registered, professional engineer to certify that equipment to be supplied meets and/or exceeds the design criteria of these specifications.
  4. The telescopic seating system manufacturer shall have all welding done in a CWB/AWB certified shop.
  5. It will be the responsibility of the bidder to furnish with his bid a list clarifying any deviation from these specifications, written or implied.
- B. Acceptable Installer
  1. Installers to be recognized, trained and certified by the telescoping bleacher seating manufacturer.

## **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver telescopic gym seats in manufacturers packaging clearly labeled with manufacturer name and content.
- B. Handle seating equipment in a manner to prevent damage.
- C. Deliver the seating at a scheduled time for installation that will not interfere with other trades operating in the building.

## 1.08 PROJECT CONDITIONS

- A. Field Measurements: Coordinate actual dimensions of construction affecting telescoping bleachers installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

## 1.09 WARRANTY

- A. Submit manufacturers standard warranty form for Telescopic seating systems.
  - 1. The manufacturer shall guarantee all work performed under these specifications to be free from defects for a period of one (1) full year.
  - 2. Replacement structural steel components, nuts, bolts, axles, and wheels as necessary to maintain the integrity of the original installation, will be provided at no charge for a period of twenty (20) years.
  - 3. The guarantee shall be limited to the fair use of the Telescopic Seating System and shall not include acts of vandalism, fire, flood or other situations that do not fall into the general use requirements of the bleachers.
  - 4. A yearly inspection and required maintenance must be performed to maintain the extended 20-year warranty.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. The basis of design for the gymnasium seating shown on the plans and detailed in these specifications is by Sheridan Seating Inc., (705) 326-7463, [info@sheridanseating.com](mailto:info@sheridanseating.com)
  - 1. Model: W100 Wood Seats or M200 Molded Seats
  - 2. Aisle Type: Foot level Aisles with center aisle railings with curved top rail terminations.
  - 3. End rails: Typically self-storing ready rails.
  - 4. Operation: Integrally powered friction electric operation or manual operation.
  - 5. Product Requirements:
    - a. System to be wall attached. System shall be floor attached where reverse folding.
    - b. Bank length as required by specifications.
    - c. Total number of rows as required by specifications.
    - d. Row rise: 10'', 11 5/8'', or as required by specifications
    - e. Row spacing: 22'', 24'', 26'' or as required by specifications.
  - 6. Accessories:
    - a. Handicap seating provisions: Provide first tier handicap cutouts to comply with American Disabilities Act (ADA). All handicap cutouts shall have required railings. Double center cutouts will be recoverable.
      - 1) Provisions for companion seating will be made and indicated on the drawings.
    - b. Scorers table 15'' X 96''. Table shall be self-supporting and portable to be used anywhere within the bleacher system or on the gymnasium floor.

- c. Self-storing End Rails: All railings to receive powder-coating finish (black).
- d. P Rails: Every other deck shall have an intermediate pedestal mounted railing. These railings shall have a round handrail and shall be self-storing without the need of dismantling. Railings to receive powder-coated finish (black).
- e. Obstructions: Note any obstructions (columns, drainage pipes, overhead ducts, etc.) on final shop drawings.

## 2.02 FABRICATION

- A. Understructure System
  - 1. Structural high-tensile steel columns fabricated from minimum size 1-1/2" x 3" x 10-gauge structural tubing.
  - 2. Bracing: 1-1/2" square, structural tubing
  - 3. Row Locks: Provide two per each row, per bleacher section made of 1/4" plate, hot rolled steel.
  - 4. Wheels shall be 4" diameter x 1-1/4" width.
  - 5. Maximum spacing between columns shall be 11'-6".
  - 6. Finish: Provide manufacturers black, semi-gloss, machinery enamel
- B. Deck System
  - 1. Footboards shall be 3/4" plywood with top facing. All surfaces shall be thoroughly sealed. Top facing shall receive three coats of colored, opaque, catalyzed epoxy coating. Aluminum trim shall be installed on exposed edges. Adjacent foot boards shall be joined by means of extruded aluminum joiner beam sized for 3/4" footboards.
  - 2. Optional Upgrade – Panelam decking on 3/4" plywood.
  - 3. Optional Upgrade – Aluminum decking.
  - 4. Provide thru-bolt fastening through galvanized steel riser beams at locations of splices in rear riser. Front deck connection shall be provided using front steel nose beams.
- C. Decking and Riser Supports
  - 1. Decking and riser supports shall form rigid closed deck structure. Tapered deck stiffeners shall be bolted through the front and back.
- D. Seat System
  - 1. Molded Structural Foam: Provide one-piece, high density structural polyethylene foam. Scuff resistant, textured solid color with anatomically correct tops. Color(s) for the seat modules shall be determined by the Architect by providing color charts. Contrasting color effects can be created with custom colors.
  - 2. Wood: Provide full 4/4" kiln dried, select southern yellow pine with rounded edges. Provide sanding sealer and three coats of clear polyurethane finish on top and sides.

- E. Electrical System
  - 1. Tractor Drive System: A series of electric drives are located under the first row in sufficient quantities necessary to move the system in and out effortlessly. Each tractor drive consists of two 12" wide x 6" diameter cylinder wheels covered with a specially formulate white 60 durometer soft-faced rubber grooved for positive grip and low wear while reducing stress on floor. The tractor is operated by a minimum 1/4" HP gear reduction motor built into a height adjustable steel framework and containing additional weight plates for added traction where necessary. These drives operate from one central control box and a single plug-in, hand-held, low-voltage remote pendant controller which has, in addition to an in-and-out button, a left and a right jog button used to always allow for straight and true steering (steering provided where required). The standard system operates with 3 phase, 208 volt, 60 Hz power. Optional power source can be supplied as required.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Manufacturer's representative or bleacher system installer shall demonstrate the proper method of operation of the bleacher system to the Owner and Architect upon completion of the work.
- B. Telescopic Seating Subcontractor shall verify that all areas are free of impediments interfering with the installation and that substrates are acceptable to receive seating in accordance with the manufacturer's recommendations.
- C. Electrical wiring within the building as required for power operation of the bleachers shall be provided by others.

#### **3.02 INSTALLATION**

- A. Seating shall be installed in accordance with the manufacturer's instructions and final shop drawings. Telescopic Seating Subcontractor will install all accessories, anchors, inserts and other items for installation of seating and for permanent attachment to adjoining construction.
- B. Adjustment and Cleaning: Upon completion of installation, Telescopic Seating Subcontractor shall adjust each seating assembly to operate in compliance with manufacturer's recommendations. Telescopic Seating Subcontractor shall clean installed seating on exposed or semi-exposed surfaces and touch-up all exposed finishes.
- C. The manufacturer reserves the right to incorporate design changes and material substitutions as it sees fit to improve the overall product.

**END OF SECTION 12 66 13**



**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.
- B. Expansion loops.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior fire protection piping systems.
- C. Section 09 91 23 - Interior Painting: Preparation and painting of interior fire protection piping systems.
- D. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- E. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- F. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

**1.03 REFERENCE STANDARDS**

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- B. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.

- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- H. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- I. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- J. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- K. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- L. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).
- M. AWWA C606 - Grooved and Shouldered Joints; 2015.
- N. FM (AG) - FM Approval Guide; current edition.
- O. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. UL (DIR) - Online Certifications Directory; Current Edition.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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. Manufacturer's Qualification Statement.
- E. Installer's Qualification Statement.
- F. Project Record Documents: Record actual locations of components and tag numbering.
- G. Operation and Maintenance Data: Include installation instructions and spare parts lists.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### **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 in this section.
  - 1. Minimum three years experience.
  - 2. Approved by manufacturer.
- C. Comply with FM (AG) and UL (DIR) requirements.
- D. Valves: Bear FM (AG) and UL (DIR) 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.

## **1.06 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.

## **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 FIRE PROTECTION SYSTEMS**

- A. Sprinkler Systems: Comply with NFPA 13.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

### **2.02 BURIED PIPING**

- A. Ductile Iron Pipe: AWWA C151/A21.51.
  - 1. Fittings: AWWA C110/A21.10, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
  - 3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

### **2.03 ABOVE GROUND PIPING**

- A. Steel Pipe: Schedule 10 roll grooved meeting all NFPA 13 and Factory Mutual requirements or Schedule 40 threaded or grooved meeting all NFPA 13 and Factory Mutual requirements, black.
  - 1. Steel Fittings: .
  - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.

4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
  5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
1. Fittings: AWWA C110/A21.10, standard thickness.
  2. Joints: AWWA C111/A21.11, SBR or vulcanized styrene-butadiene rubber gasket.
  3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

#### **2.04 PIPE SLEEVES**

- A. 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.
- B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
1. Zinc-coated or cast-iron pipe.
  2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
1. Galvanized steel pipe or black iron pipe with asphalt coating.
  2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical Room Floors :
1. Galvanized steel pipe or black iron pipe with asphalt coating.
  2. Connect sleeve with floor plate except in mechanical rooms.

- F. Not required for wall hydrants for fire department connections or in drywall construction.
- G. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- H. 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 84 00 to prevent the spread of fire, smoke, and gases.

## **2.05 MANUFACTURED SLEEVE-SEAL SYSTEMS**

- A. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  - 2. Provide watertight seal between pipe and wall/casing opening.
  - 3. Elastomer element size and material in accordance with manufacturer's recommendations.
  - 4. Glass-reinforced plastic pressure endplates.

## **2.06 FIRE-RATED ENCLOSURES**

- A. Provide as required to preserve fire resistance rating of building elements.

## **2.07 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.

## **2.08 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. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- E. Vertical Support: Steel riser clamp.
- F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- H. Seismic Hangers and Couplings:
  - 1. Provide coupling with a factory set disengagement rating of 140 percent to 160 percent of the static weight.
  - 2. Provide resettable and reusable, break away couplings.
  - 3. Provide tether cables to avoid excessive seismic joint movement.
  - 4. Coupling to be manufactured from non-corrosive materials.

## **2.09 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID**

- A. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.
- B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
- C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
  - 1. Maximum Allowable Working Pressure: 150 psig at 120 degrees F.
  - 2. Accommodate the Following:
    - a. Angular Rotation: 15 degrees.
    - b. Force developed by 1.5 times specified maximum allowable operating pressure.
  - 3. End Connections: Same as specified for pipe jointing.

4. Provide necessary accessories including, but not limited to, swivel joints.

## **2.10 MECHANICAL COUPLINGS**

### **A. 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.
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.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.02 INSTALLATION**

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts:



SECTION 21 05 00  
COMMON WORK RESULTS FOR FIRE SUPPRESSION

1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- G. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  2. Place hangers within 12 inches of each horizontal elbow.
  3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
    - a. Painting of interior fire suppression systems is specified in Section 09 91 23.
    - b. Painting of exterior fire suppression systems is specified in Section 09 91 13.
- H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- I. 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.
1. Painting of interior fire suppression systems is specified in Section 09 91 23.
  2. Painting of exterior fire suppression systems is specified in Section 09 91 13.
- J. Structural Considerations:
1. Do not penetrate building structural members unless indicated.
- K. 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. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
  4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- L. 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 watertight seal.
  6. Install in accordance with manufacturer's recommendations.
- M. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
  2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
  3. Attach plates at the underside only of suspended ceilings.
  4. 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. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

### 3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.

SECTION 21 05 00  
COMMON WORK RESULTS FOR FIRE SUPPRESSION

- 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.
- C. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Check valves.
- B. Bronze OS&Y gate valves.
- C. Iron OS&Y gate valves.
- D. NRS gate valves.
- E. Trim and drain valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.
- B. Section 21 13 00 - Fire-Suppression Sprinkler Systems.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. NRS: Non-rising stem.
- B. OS&Y: Outside screw and yoke.
- C. 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; 2015.
- C. ASME B31.9 - Building Services Piping; 2017.
- D. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

## GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

- E. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.
- F. AWWA C606 - Grooved and Shouldered Joints; 2015.
- G. FM (AG) - FM Approval Guide; current edition.
- H. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- K. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.

**1.05 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.

**1.06 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

### **1.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
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. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- D. Installer Qualifications:
1. Company specializing in performing the work of this section with minimum five years documented experience.
  2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
  3. Complies with manufacturer's certification requirements.
  4. Complies with manufacturer's insurance requirements.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
  2. Protect threads 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.

## GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

- b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
  - 1. Do not use operating handles or stems as lifting or rigging points.

**PART 2 - PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
  - 1. Main Level: HAMV - Fire Main Equipment.
  - 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
    - a. Level 1: VQGU - Valves, Trim, and Drain.
- B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
  - 1. Automated Sprinkler Systems:
    - a. Indicator posts.
    - b. Valves:
      - 1) Gate valves.
      - 2) Single check valves.
      - 3) Miscellaneous valves.
- C. ASME Compliance:
  - 1. ASME B16.1 for flanges on iron valves.
  - 2. ASME B1.20.1 for threads on threaded-end valves.
  - 3. ASME B31.9 for building services piping valves.
- D. Comply with AWWA C606 for grooved-end connections.
- E. Comply with NFPA 13 for valves.
- F. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Actuator Types:



## GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

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 CHECK VALVES**

- A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- B. AWWA C508 compliant check valves.
- C. Minimum Pressure Rating: 175 psig.
- D. Type: Center guided check valve.
- E. Body Material: Cast iron, ductile iron.
- F. Center guided check with elastomeric seal.
- G. Hinge Spring: Stainless steel.
- H. End Connections: Flanged, grooved, or threaded.

**2.03 BRONZE OS&Y GATE VALVES**

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Bronze or brass.
- D. Wedge: One-piece bronze or brass.
- E. Wedge Seat: Bronze.
- F. Stem: Bronze or brass.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Threaded.

**2.04 IRON OS&Y GATE VALVES**

## GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. AWWA C508 compliant gate valves.
- C. Minimum Pressure Rating: 175 psig.
- D. Body and Bonnet Material: Cast or ductile iron.
- E. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
- F. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
- G. Stem: Brass or bronze.
- H. Packing: Non-asbestos PTFE.
- I. Supervisory Switch: External.
- J. End Connections: Flanged.

**2.05 NRS GATE VALVES**

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron with elastomeric coating.
- E. Stem: Brass or bronze.
- F. Packing: Non-asbestos PTFE.
- G. Supervisory Switch: External.
- H. End Connections: Flanged.

**2.06 TRIM AND DRAIN VALVES**

- A. Ball Valves:

## GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

1. Description:
  - a. Pressure Rating: 175 psig.
  - b. Body Design: Two piece.
  - c. Body Material: Forged brass or bronze.
  - d. Port Size: Full or standard.
  - e. Seat: PTFE.
  - f. Stem: Bronze or stainless steel.
  - g. Ball: Chrome-plated brass.
  - h. Actuator: Hand-lever.
  - i. End Connections for Valves 1 NPS through 2-1/2 NPS: Threaded ends.
  - j. End Connections for Valves 1-1/4 NPS and 2-1/2 NPS: Grooved ends.

## B. Angle Valves:

1. Description:
  - a. Pressure Rating: 175 psig.
  - b. Body Material: Brass or bronze.
  - c. Ends: Threaded.
  - d. Stem: Bronze.
  - e. Disc: Bronze.
  - f. Packing: Asbestos free.
  - g. Handwheel: Malleable iron, bronze, or aluminum.

## C. Globe Valves:

1. Description:
  - a. Pressure Rating: 175 psig.
  - b. Body Material: Bronze with integral seat and screw-in bonnet.
  - c. Ends: Threaded.
  - d. Stem: Bronze.
  - e. Disc Holder and Nut: Bronze.
  - f. Disc Seat: Nitrile.
  - g. Packing: Asbestos free.
  - h. 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 all defective valves with new valves.

### **3.02 INSTALLATION**

- A. Comply with specific valve installation requirements and application in the following Sections:
  - 1. Section 21 13 00 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
  - 1. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
- D. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.
- E. Valves in horizontal piping installed with stem at or above the pipe center.
- F. Position valves to allow full stem movement.
- G. Install valve tags. Comply with Section 21 05 53 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

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## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Seismic control requirements.
  - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Vibration isolators.
- D. External seismic snubber assemblies.
- E. Seismic restraint systems

**1.02 RELATED REQUIREMENTS**

- A. Section 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Section 03 30 00 - Cast-in-Place Concrete.

**1.03 DEFINITIONS**

- A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

**1.04 REFERENCE STANDARDS**

- A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

- C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. FM 1950 - Examination Standard for Seismic Sway Braces for Pipe, Tubing and Conduit; 2023.
- H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- L. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

**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. Seismic Controls:
    - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

others.

- b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
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 30 00.

## 1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. 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.

D. Shop Drawings - Seismic Controls:

1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify mounting conditions required for equipment seismic qualification.
3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
4. Indicate proposed arrangement of distributed system trapeze support groupings.
5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.

E. Seismic Design Data:

1. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required



## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

to design appropriate seismic controls.

2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.
- F. Certification for seismically qualified equipment; identify basis for certification.
- G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- H. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Evidence of qualifications for seismic controls designer.
- J. Evidence of qualifications for manufacturer.
- K. Manufacturer's detailed field testing and inspection procedures.
- L. 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.
  1. Designer may be employed by the manufacturer of the seismic restraint products.
- 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**

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

**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.
  - 3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
- D. Piping Isolation:
  - 1. Use flexible piping connections to vibration-isolated equipment.

**2.02 SEISMIC CONTROL REQUIREMENTS**

- A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.
- B. Seismic Design Criteria: As indicated on drawings.
- C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.
- D. Seismic Qualification of Equipment:
  - 1. Provide special certification for fire suppression equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
  - 2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

3. Notify Architect and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
  4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.
- E. Premanufactured Modular Fire Suppression Equipment: Where not otherwise seismically qualified, premanufactured modules 6 feet high and taller furnished under other sections to be designed in accordance with seismic provisions for nonbuilding structures.
- F. Seismic Restraints:
1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
  2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 412.
    - c. FEMA 413.
    - d. FEMA 414.
    - e. FEMA E-74.
    - f. SMACNA (SRM).
  3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
  4. Seismic Type Vibration Isolators:
    - a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
  5. External Seismic Snubber Assemblies:
    - a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
    - b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
  6. Seismic Restraint Systems:
    - a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

- b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
- c. Use only cable restraints to restrain vibration-isolated fire suppression components.
- d. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
- f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
- g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
- h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

## G. Seismic Attachments:

1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  7. Concrete Housekeeping Pads:
    - a. Increase size of pad as required to comply with anchor requirements.
    - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.
- H. Seismic Interactions:
1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
  2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
  3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.
- I. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
    - a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
    - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
    - c. Design displacements at seismic separations.
    - d. Anticipated drifts between floors.
  2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

**2.03 VIBRATION ISOLATORS**

## A. 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.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

- e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
- f. Selected to function without undue stress or overloading.
- 3. Seismic Snubbing Elements for Seismic Isolators:
  - a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
  - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.
- B. Vibration Isolators for Seismic Applications:
  - 1. Resilient Material Isolator Mounts, Seismic:
    - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
  - 2. Restrained Spring Isolators, Seismic:
    - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
    - b. Bottom Load Plate: Steel 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.
  - 3. Resilient Material Isolator Hangers, Seismic:
    - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
  - 4. Spring Isolator Hangers, Seismic:
    - 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; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
    - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
  - 5. Combination Resilient Material/Spring Isolator Hangers, Seismic:

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

- 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) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
- b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

**2.04 EXTERNAL SEISMIC SNUBBER ASSEMBLIES**

- A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.
- B. Seismic Snubbing Elements:
  1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
  2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

**2.05 SEISMIC RESTRAINT SYSTEMS**

- A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- B. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.
- C. Cable Restraints:
  1. Comply with ASCE 19.
  2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
  3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
  4. Use protective thimbles for cable loops where potential for cable damage exists.
- D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

**PART 3 - EXECUTION****3.01 CODE-REQUIRED SPECIAL INSPECTIONS**

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  - 1. Continuous Special Inspections: Special Inspection Agency 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 Inspections: Special Inspection Agency 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.
- C. Seismic special inspections include, but are not limited to:
  - 1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
  - 2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
  - 3. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
  - 4. Verification of required clearances between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.
- D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.



## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

**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. Spring Isolators:
    - a. Position equipment at operating height; provide temporary blocking as required.
    - 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.
  - 2. 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.
  - 3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
  - 4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
  - 5. Adjust isolators to be free of isolation short circuits during normal operation.
  - 6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.
- F. Seismic Controls:
  - 1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
  - 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.

## VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
  - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
  - a. Size in accordance with seismic design to meet anchor requirements.
  - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
  - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
  - b. Install restraints within permissible angles in accordance with seismic design.
  - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
  - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
  - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - 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. Seismic Controls:
  1. Verify snubbing element air gaps.

VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 91 23 - Interior Painting: Stencil paint.

**1.03 REFERENCE STANDARDS**

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.
- F. Project Record Documents: Record actual locations of tagged valves.

**PART 2 - PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Major Control Components: Nameplates.
- B. Piping: Tags.

- C. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

## **2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.

- 1. Letter Color: White.

## **2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

## **2.04 PIPE MARKERS**

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- E. Color code as follows:
  - 1. Fire Quenching Fluids: Red with white letters.

## **2.05 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.

## **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 91 23 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. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Water pipe.
- B. Valves.
- C. Fire department connections.
- D. Bedding and cover materials.
- E. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 09 91 13 - Exterior Painting.
- C. Section 09 91 23 - Interior Painting.
- D. Section 21 05 00 - Common Work Results for Fire Suppression.
- E. Section 21 13 00 - Fire-Suppression Sprinkler Systems.
- F. Section 31 23 16 - Excavation.
- G. Section 31 23 16.13 - Trenching.
- H. Section 31 23 23 - Fill.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings;  
2018.



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FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

- E. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- F. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- J. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015.
- K. ASTM B63 - Standard Test Method for Resistivity of Metallically Conducting Resistance and Contact Materials; 2007 (Reapproved 2018).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- N. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications; 2022.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2022a.
- P. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
- Q. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings; 2022.

- R. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- S. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- T. AWWA C205 - Cement–Mortar Protective Lining and Coating for Steel Water Pipe—4 In. (100 mm) and Larger—Shop Applied; 2018.
- U. AWWA C206 - Field Welding of Steel Water Pipe; 2017.
- V. AWWA C209 - Tape Coatings for Steel Water Pipe and Fittings; 2019.
- W. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2015.
- X. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.
- Y. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2017.
- Z. AWWA M11 - Steel Pipe - A Guide for Design and Installation; 2016, with Addendum (2019).
- AA.CDA A4015 - The Copper Tube Handbook; Current Edition.
- BB.FM (AG) - FM Approval Guide; current edition.
- CC.NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition  
Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- DD.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. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

### 1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Product Data:
  - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
  - 2. Provide manufacturer's catalog information.
  - 3. Indicate valve data and ratings.
  - 4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Test Reports: Factory certified tests to verify that short-term rupture strength for RTRP I (filament bound) jointing is 1,500 psi or greater.
- F. Field Quality Control Submittals: Testing activities.
- G. Project Record Documents:
  - 1. Record actual locations of piping mains, valves, connections, fire hydrants, free-standing fire department connections, underground manholes and vaults, valve boxes, thrust restraints, and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- H. Maintenance Data: Include installation instructions, spare parts lists, and exploded assembly views.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements for additional provisions.

### 1.06 QUALITY ASSURANCE

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- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- E. Provide grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.
- F. Date stamp castings used for coupling housings, fittings, and valve bodies for quality assurance and traceability.
- G. Coupling Manufacturer:
  - 1. Perform on-site training by factory-trained representative to Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
  - 2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
  - 3. A distributor's representative is not considered qualified to perform the training.
- H. Welder Qualifications:
  - 1. Certify in accordance with ASME BPVC-IX.
  - 2. Provide certificate of compliance from local Authority Having Jurisdiction, indicating approval of welders.
- I. Valves: Bearing product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- J. Products:

1. Listed, classified, and labeled as suitable for the purpose specified and indicated.
  2. Refer to FM (AG) - FM Approval Guide and UL (DIR).
- K. Perform Work in accordance with local authorities having jurisdiction, municipality, and water utility requirements.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **1.08 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 WATER PIPE**

- A. Steel Pipe and Fittings:
  1. Pipe: Standard weight, zinc-coated, listed, ASTM A53/A53M.
  2. Fittings: Comply with ASME B16.3 Class 150, zinc coated, threaded or ASME B16.4 Class 125, zinc-coated.
  3. Mechanically Factory Applied Protective Materials:
    - a. Clean by wire brushing and solvent cleaning.
    - b. Apply one coat of coal-tar primer and two coats of coal-tar enamel complying with AWWA C203.
    - c. Protect threaded pipe ends and fittings prior to coating.

- B. Ductile Iron Pipe: Listed, AWWA C104/A21.4:
  - 1. Fittings: Ductile iron, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with rods.
  - 3. Jackets: AWWA C105/A21.5 polyethylene jacket.
- C. Copper Tubing: Listed, ASTM B88 (ASTM B88M), Type K (A), annealed.
  - 1. Fittings: ASME B16.18 cast copper or ASME B16.22 wrought copper.
  - 2. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.

## 2.02 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Detector Check with Water Meter:
  - 1. 4 NPS up to and including 10 NPS:
    - a. Description: Check valve, water meter, by-pass piping, and isolation valves designed to measure both low flow and high water volume usage.
      - 1) Listed.
      - 2) Valve Body: Comprised of epoxy coated stainless steel, ductile iron, or cast iron.
      - 3) Valve Ends: Flanged.
- C. Water Pressure Reducing Valves:
  - 1. 1-1/2 NPS up to and including 8 NPS:
    - a. Function: Reduce higher inlet pressure to an adjustable, constant lower outlet pressure independent of flow rate fluctuations.
    - b. Pilot-Operated Type: External pilot control.
    - c. Construction:
      - 1) Listed .
      - 2) Body: Ductile iron complying with ASTM A536, Grade 65-45-12.
      - 3) Internal Ferrous Materials: Coated with 4 mils of epoxy.
      - 4) External Surfaces: Coated with 4 mils of epoxy followed by coat of fire red enamel paint.
      - 5) Main Valve Seat Ring: Bronze, complying with ASTM B61.
      - 6) Stem: Stainless Steel.
      - 7) Elastomers (diaphragms, resilient seats, and O-rings): Buna-N.
      - 8) Pilot Control System: Bronze, complying with ASTM B61, with stainless steel trim.
- D. Gravity (Swing) Check Valve, Flanged End:

1. 2-1/2 NPS up to and including 10 NPS:
  - a. Construction:
    - 1) Listed.
    - 2) Body: Cast iron complying with ASTM A126, Class B.
    - 3) Disc: ASTM A126 cast iron, ASTM A536 ductile iron, or ASTM B584 cast brass.
    - 4) Replaceable seats and discs.
    - 5) Maximum Working Pressure: 175 psi.
- E. Gravity (Swing) Check Valve, Grooved End:
  1. 2-1/2 NPS up to and including 6 NPS:
    - a. Construction:
      - 1) Listed .
      - 2) Body: ASTM A48/A48M gray iron, ASTM A126 cast iron, or ASTM A536 cast iron.
      - 3) Coatings (as applicable): Rust inhibiting orange enamel paint on exterior and interior surfaces.
      - 4) Clapper:
        - (a) Material: Constructed of stainless steel or ductile iron.
        - (b) Facing: EPDM.
      - 5) Seat: Constructed of stainless steel, brass, or bronze.
      - 6) Spring: Stainless steel.
      - 7) Hinge Pin: Stainless steel.
      - 8) Maximum Working Pressure: 250 psi.
- F. Detector Check Valve, Flanged End:
  1. 4 NPS up to and including 10 NPS:
    - a. Construction:
      - 1) Listed.
      - 2) Body: Constructed of heavy steel, 300 series stainless steel, or ASTM A536 ductile iron to AWWA C550, as applicable.
      - 3) Coating: Fusion bonded epoxy in accordance with AWWA C550.
      - 4) Spring and Linkage: Stainless steel.
      - 5) Removable Clapper Seat Ring: Bronze.
      - 6) Seat: ASTM B63 bronze.
      - 7) Maximum Working Pressure: 175 psi.
- G. Double Check Detector Valve Assembly, Flanged End:
  1. 2-1/2 NPS up to and including 10 NPS:
    - a. Construction:
      - 1) Listed .

- 2) Body: 300 Series stainless steel or ASTM A536 Grade 65-45-12 ductile iron.
- 3) Two independently operating, spring-loaded, check valves.
- 4) Two OSY resilient seated gate valves.
- 5) Bypass Assembly:
  - (a) Bypass Line: Hydraulically sized to accurately measure low flow.
  - (b) Double check including shut-off valves, and required cocks.
  - (c) Meter with readout.
- 6) Cam-Check:
  - (a) Internally loaded, providing positive, drip-tight closure against reverse flow.
  - (b) Stainless steel cam arm and spring, rubber-faced disc, and replaceable, thermoplastic seat.
- 7) Valve Cover:
  - (a) Provides access to all internal parts.
  - (b) Held in place through the use of a single grooved style two-bolt coupling.

H. Reduced-Pressure Zone (RPZ) Device, Flanged End:

1. 2-1/2 NPS up to and including 10 NPS:
  - a. Construction:
    - 1) Listed .
    - 2) Main Valve Body: ASTM A536 Grade 65-45-12 ductile iron, 300 Series, stainless steel, or 304 Series, stainless steel
    - 3) Relief Valve Body: ASTM A536 Grade 65-45-12 ductile iron, 300 Series stainless steel, or 304 Series stainless steel
    - 4) Coating (As Applicable): Fusion epoxy internal and external, AWWA C550.
    - 5) Shutoff Valves: NRS resilient wedge gate valve, AWWA C509.
    - 6) Check Seats: Stainless steel.
    - 7) Disc Holder: Stainless steel.
    - 8) Elastomer Disc: Silicone, PPE/polystyrene, EPDM, or Buna-N.
    - 9) Spring: Stainless steel.
    - 10) Inlet/Outlet Flow:
      - (a) Inlet:
        - (1) Orientation: Horizontal.
        - (2) Flow Direction: Up.
      - (b) Outlet:
        - (1) Orientation: Vertical.
        - (2) Flow Direction: Horizontal.



I. Atmospheric Vacuum Breaker, Threaded End:

1. 1 NPS up to and including 2 NPS:
  - a. Construction:
    - 1) Valve Body and Cover: ASTM A126 Class B cast iron or ASTM A536 65-45-12 ductile iron
    - 2) Float, Guide Shafts, and Bushings: Fabricate with Type 316 stainless steel or polymer based materials.

**2.03 FIRE DEPARTMENT CONNECTIONS:**

A. Free-Standing Inlet:

1. Construction:
  - a. Listed .
  - b. Type: Free standing type, ASTM B584 poured brass alloy.
  - c. Inlets: Two way, 2-1/2 inch female inlets, thread size compatible with fire department hardware.
  - d. Rated Working Pressure: 175 psi.
  - e. Double clapper-valves, rocker-lug caps and chain, and cast-in function-identifying lettering.
  - f. Finish: Polished chrome.
  - g. Label: Sprinkler - Fire Department Connection.

**2.04 BEDDING AND COVER MATERIALS**

A. Bedding: As specified in Section 31 23 16.13.

B. Cover: As specified in Section 31 23 16.13.

**2.05 ACCESSORIES**

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 30 00.

B. Supervisory Switches: Refer to Section 21 13 00 for waterflow and supervisory switches.

C. Tracer Wire:

1. Provide magnetic, detectable conductor with clear plastic covering and imprinted with "Water Service" in large letters.
2. Conductor to be of sufficient length to be continuous over each separate run of nonmetallic pipe.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

#### **3.02 PREPARATION**

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

#### **3.03 TRENCHING**

- A. Earthwork: Perform earthwork operations in accordance with Sections 31 23 16, 31 23 16.13, and 31 23 23.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Form and place concrete for pipe thrust restraints at each change of pipe direction.  
Place concrete to permit full access to pipe and pipe accessories.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

#### **3.04 INSTALLATION**

- A. General Requirements:
  - 1. Location of Water Lines:
    - a. Terminate the work covered by this Section at a point approximately 5 feet from the building unless indicated otherwise.
    - b. Do not install water line closer horizontally than 10 feet from any sewer line.
    - c. Water Piping Parallel With Sewer Piping:
      - 1) Install water piping minimum 10 feet horizontally (measured edge-to-edge) from a sewer or sewer manhole where possible.
      - 2) Bottom (Invert) of Water Piping:
        - (a) Minimum 18 inches above top (crown) of sewer piping.

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- (b) Where this vertical separation of 18 inches above top (crown) of sewer piping cannot be obtained, the installation will be acceptable only when sewer piping is constructed of AWWA approved water pipe and pressure tested in place without leakage prior to backfilling.
- d. Water Piping Crossing Sewer Piping:
  - 1) Crossing Under:
    - (a) Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber gasketed joints and no joint is located within 3 feet horizontally of the crossing.
  - 2) Crossing Over:
    - (a) Install water lines which cross over sewer force mains and inverted siphons at least 2 feet above these sewer lines; when joints in the sewer line are within 3 feet horizontally from the water line, encase joints in concrete.
    - (b) Provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.
    - (c) When local conditions prevent a minimum, vertical separation as described above, use the following construction:
      - (1) Provide sewer piping passing over or underwater piping constructed of AWWA approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.
      - (2) Protect water piping passing under sewer piping by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints are equidistant and located as far as possible from the sewer piping.
- e. Do not install water lines in the same trench with gas lines, fuel lines, or electric wiring.
- f. Do not install copper tubing in the same trench with ferrous piping materials.
- g. Do not install water piping through or to come into contact with any part of a sewer manhole.

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- h. Where nonferrous metallic pipe crosses any ferrous piping, provide a minimum vertical separation of 1 foot between pipes.
2. Sleeving:
- a. Sleeve water piping where piping is required to be installed within 3 feet of existing structures.
  - b. Provide ductile iron or Schedule 40 steel sleeves.
  - c. Fill annular space between pipe and sleeves with mastic.
  - d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.
3. Pipe Laying and Jointing:
- a. Remove fins and burrs from pipe and fittings.
  - b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
  - c. Provide proper facilities for lowering pipe sections into trenches.
  - d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
  - e. Cut pipe in a neat, workmanlike manner accurately to length established at the site and work into place without forcing or springing.
  - f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
  - g. Wedging or blocking between bells and spigots will not be permitted.
  - h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
  - i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
  - j. Support piping at proper elevation and grade.
  - k. Secure firm, uniform support.
  - l. Wood support blocking will not be permitted.
  - m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
  - n. Provide anchors and supports where indicated and necessary for fastening work into place.
  - o. Provide proper provisions for expansion and contraction of pipelines.
  - p. Keep trenches free of water until joints have been properly made.
  - q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each workday.
  - r. Do not install pipe during unacceptable trench conditions or inclement weather.
  - s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet.

4. Connections to Existing Water Lines:
    - a. Ensure minimal interruption of service on the existing line.
    - b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.
  5. Penetrations:
    - a. Provide ductile-iron or Schedule 40 steel for pipes passing through walls of valve pits and structures.
    - b. Fill annular space between sleeves and walls with rich cement mortar.
    - c. Fill annular space between pipe and sleeves with mastic.
  6. Flanged Pipe: Install only above grade.
- B. Special Requirements:
1. Ductile Iron Piping:
    - a. Unless otherwise specified, install pipe and fittings in accordance with paragraph "General Requirements".
    - b. Jointing:
      - 1) Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
      - 2) Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11.
      - 3) Make flanged joints with the gaskets, bolts, and nuts specified for this type joint.
        - (a) Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other accessories and equipment.
        - (b) Align bolt holes for each flanged joint.
        - (c) Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
        - (d) Do not allow adjoining flange faces to be out of parallel to such a degree that the flanged joint cannot be made watertight without over-straining the flange.
        - (e) When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions.
        - (f) Use set-screwed flanges to make flanged joints where conditions prevent the use of full length, flanged pipe and assemble in accordance with the recommendations of the set-screwed flange

manufacturer.

- 4) Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer.
  - 5) Make grooved and shouldered type joints with the couplings previously specified for this type joint connecting pipe with the grooved or shouldered ends specified for this type joint; assemble in accordance with the recommendations of the coupling manufacturer.
    - (a) Groove pipe in the field only with approved grooved cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings; secure approval for field-cut grooves before assembling the joint.
  - 6) Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint.
    - (a) Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves be full size for the bolt holes.
    - (b) Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- c. Allowable Deflection:
- 1) Maximum Allowable Deflection: As stated in AWWA C600.
  - 2) If the alignment requires deflection in excess of the above limitations, furnish special blends or a sufficient number of shorter pipe lengths to provide angular deflections within the limit set forth.
- d. Pipe Anchorage:
- 1) Provide concrete thrust blocks (reaction backing), for pipe anchorage except where metal harness is indicated.
  - 2) Thrust blocks to comply with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks to be as indicated.
  - 3) Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
  - 4) Provide metal harness in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps as indicated in NFPA 13, except as otherwise indicated.
- e. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.
2. Steel Piping:
- a. Jointing:

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- 1) Bell-and-Spigot: Make rubber-gasketed, bell-and-spigot joints with the gaskets previously specified for this type of joint, using an approved lubricant, all in accordance with the pipe manufacturer's recommendations.
- 2) Welded: Make welded joints in accordance with AWWA C206 and install in accordance with AWWA M11.
- 3) Flanged:
  - (a) Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
  - (b) Align bolt holes for each flanged joint.
  - (c) Use full-size bolts for the bolt holes; use of undersized bolts due to misalignment of bolt holes or for any other purpose will not be allowed.
  - (d) Do not allow adjoining flange faces to be out of parallel to such a degree that the flanged joint cannot be made water-tight without straining the flange.
  - (e) When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it with one of correct dimensions.
- 4) Grooved:
  - (a) Make grooved type joints with the couplings specified for this type joint connecting pipe with roll-grooved ends or pipe with welded-on cut-grooved adapters, each with dimensions as previously specified for this type of joint.
  - (b) Groove pipe ends in the field only with approved groove rolling equipment and groove adapters in the field only with approved groove cutting equipment; use only groove rolling and groove cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings.
  - (c) Obtain approval for field-cut grooves prior to assembling the joint.
- 5) Shouldered: Make shouldered type joints with the couplings specified for this type joint connecting pipe with the shouldered ends specified for this type of joint.
- 6) Assemble grooved and shouldered type joints in accordance with the recommendations of the coupling manufacturer.
- 7) Insulating:
  - (a) Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts specified for this type joint.

- (b) Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves be full size for the bolt holes.
        - (c) Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
      - 8) Joint Finishing:
        - (a) Finish joints on piping with cement-mortar lining and on piping with cement-mortar coating as specified in Appendix on Field Joints in AWWA C205.
        - (b) Finish joints on piping with coal-tar-enamel or coal-tar epoxy coating by cleaning, priming, coating, and wrapping with a cold-applied tape coating complying with and applied in accordance with AWWA C209.
    - b. Allowable Offsets:
      - 1) For pipe with bell-and-spigot rubber-gasket joints, 5 degrees maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets; unless a lesser amount is recommended by the manufacturer.
      - 2) Form short-radius curves and closures by short lengths of pipe or fabricated specials specified.
    - c. Pipe Anchorage:
      - 1) Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated.
      - 2) Thrust blocks to be in accordance with the recommendations for thrust restraint in AWWA M11, except that size and positioning of thrust blocks are to be as indicated.
      - 3) Use ASTM C94/C94M concrete having a minimum compressive strength of 2500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
      - 4) Metal Harness:
        - (a) Provide in accordance with the recommendations for joint harnesses in AWWA M11, except as otherwise indicated.
        - (b) Fabricated by the pipe manufacturer and furnished with the pipe.
  - 3. Copper Piping:
    - a. Install in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations - CDA A4015.
    - b. Bed piping in 6 inches of sand.
- C. Valves:
- 1. Set valves on solid bearing.



2. Center and plumb valve box over valve.
3. Set box cover flush with finished grade.

### **3.05 SERVICE CONNECTIONS**

- A. Provide fire water service to Local Authority Having Jurisdiction requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.
- B. Anchor fire service main to interior surface of foundation wall.
- C. Provide 18 gage, 0.0478 inch galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

### **3.06 FIELD QUALITY CONTROL**

- A. Field Tests and Inspections:
  1. See Section 01 40 00 - Quality Requirements, for additional requirements.
  2. Provide all labor, equipment, and incidentals required for field testing, except that water and electric power needed for field tests will be furnished as set forth in Section 01 51 00 - Temporary Utilities.
  3. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete after concrete thrust blocks have hardened sufficiently and at least 5 days after placing of concrete.
  4. Prior to hydrostatic testing, obtain approval from Architect for proposed method for disposal of wastewater from hydrostatic testing.
  5. The Architect will conduct field inspections and witness field tests as specified in this Section.
  6. Fill pipeline 24 hours before testing and apply test pressure to stabilize system, using only potable water.
  7. Test water piping in accordance with NFPA 13, where the additional water added to the system must not exceed the limits given in NFPA 13.
  8. Pressure test piping to 200 psi for a period of two (2) hours.
  9. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
  10. Prepare reports of testing activities.

**3.07 CLEANING**

- A. Upon completion of the installation of water lines and appurtenances, remove and haul away all surplus material, including debris resulting from the work.

**3.08 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate operation of system to Owner's personnel.
  - 1. Use operation and maintenance data as reference during demonstration.
  - 2. Conduct walking tour of project.
  - 3. Briefly describe function, operation, and maintenance of each component.
- D. Training: Train Owner's personnel on operation and maintenance of system.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.
- C. Fire department connections.

**1.02 RELATED REQUIREMENTS**

- A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.
- D. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- E. Section 28 46 00 - Fire Detection and Alarm.

**1.03 REFERENCE STANDARDS**

- A. FM (AG) - FM Approval Guide; current edition.
- B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.
- D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- F. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition  
Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and

Supplements.

- G. NFPA 1963 - Standard for Fire Hose Connections; 2019.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
  - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
  - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
  - 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
- D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- E. Designer's Qualification Statement.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. 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.

- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
  - 3. Sprinkler Wrenches: For each sprinkler type.
- J. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

### **1.06 QUALITY ASSURANCE**

- A. Comply with FM (AG) requirements.
- B. Designer Qualifications: Design system under direct supervision of a NICET Level 3 certification in Fire Protection Engineering Technology Water Based System Layout experienced in design of this type of work.
- 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 five years experience and approved by manufacturer.
- E. Equipment and Components: Provide products that bear FM (AG) label or marking.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

### **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 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light hazard; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Provide fire department connections where indicated.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 3. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
  - 4. Other Types: As required.

## 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. Finish: Enamel, color as selected.
  - 4. Cover Plate Finish: Enamel, color as selected.
  - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Pendant type.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Enamel, color as selected.
  - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Recessed horizontal sidewall type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Enamel, color as selected.
  - 4. Escutcheon Plate Finish: Enamel, color as selected.
  - 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

- D. 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. Piping drops will adhere to the FM Global requirement, maintaining a minimum of 7" radius.

### **2.03 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.
- B. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- C. Test Connections:
1. Inspector's Test Connection for Preaction Systems:
    - a. Provide test connections approximately 6 ft above floor for each or portion of each sprinkler system equipped with an alarm device, located at the 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 ft 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. Furnish one valve for each 250 gpm of system demand or fraction thereof.
    - c. Provide permanent sign reading "Test Valve" in accordance with Section 22 05 53.
- D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.



- E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- F. Fire Department Connections:
  - 1. Type: Exposed, projected wall mount made of corrosion resistant metal complying with UL 405.
    - a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
    - b. Outlet: Back with pipe threads, 4 NPS.
    - c. Rated Working Pressure: 175 psi.
    - d. Finish: Chrome.
    - e. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

### **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. Provide approved double check valve assembly at sprinkler system water source connection.
- D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- E. Place pipe runs to minimize obstruction to other work.
- F. Place piping in concealed spaces above finished ceilings.
- G. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- H. 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.

- I. Flush entire piping system of foreign matter.
- J. Hydrostatically test entire system.
- K. Require test be witnessed by Authority Having Jurisdiction.

**3.02 INTERFACE WITH OTHER PRODUCTS**

- A. Ensure required devices are installed and connected as required to fire alarm system.

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## **PART 1 - GENERAL**

### **1.01 RELATED DOCUMENTS**

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

### **1.02 SUMMARY**

- A. Section includes supplementary general requirements for the following :
1. Codes and Standards
  2. Conflicting Requirements
  3. Specifications and Drawing Conventions
  4. Fees, Permits, and Inspection
  5. Submittals
  6. Closeout Submittals
  7. Quality Assurance
  8. Product Delivery, Storage, and Handling
  9. Product Warranties
  10. Product Selection Procedures
  11. Delegated Design
  12. Coordination Drawings
  13. Emergency, Operation, and Maintenance Manuals
  14. Record Drawings
  15. Construction Waste
  16. General Coordination for Plumbing Work
  17. Excavation and Trenching
  18. Painting

### **1.03 DEFINITIONS**

- A. "Action Submittals": Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

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- C. "Basis-of-Design Product": A product in which a specific manufacturer's product is named on the drawings or is accompanied by the words "basis-of-design product" in the specifications, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- D. "Construction Waste": Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- E. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- F. "Disposal": Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- G. "File Transfer Protocol (FTP)": Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- H. "Furnish": To supply, deliver, unload, and inspect for damage.
- I. "General": Basic Contract definitions are included in the Conditions of the Contract.
- J. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

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- K. "Informational Submittals": Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- L. "Install": To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- M. "Portable Document Format (PDF)": An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- N. "Product": Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Product may be new, never before used, or re-used materials or equipment.
- O. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- P. "Provide": Furnish and install, complete and ready for the intended use.
- Q. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- R. "Salvage": Recovery of construction waste and subsequent sale or reuse in another facility.

- S. "Salvage and Reuse": Recovery of construction waste and subsequent incorporation into the Work.
- T. "System": An organized collection of parts, equipment, or subsystems united by regular interaction.
- U. "Subsystem": A portion of a system with characteristics similar to a system.

**1.04 ABBREVIATIONS AND ACRONYMS**

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AGA	American Gas Association	(202) 824-7000
	<a href="http://www.aga.org">www.aga.org</a>	
AIA	American Institute of Architects (The)	(800) 242-3837
	<a href="http://www.aia.org">www.aia.org</a>	(202) 626-7300
ANSI	American National Standards Institute	(202) 293-8020
	<a href="http://www.ansi.org">www.ansi.org</a>	
ASCE	American Society of Civil Engineers	(800) 548-2723
	<a href="http://www.asce.org">www.asce.org</a>	(703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723
	<a href="http://www.ashrae.org">www.ashrae.org</a>	(404) 636-8400
ASME	ASME International	(800) 843-2763
	(American Society of Mechanical Engineers International)	(973) 882-1170
	<a href="http://www.asme.org">www.asme.org</a>	
ASTM	ASTM International	(610) 832-9500

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	(American Society for Testing and Materials International)	
	www.astm.org	
AWS	American Welding Society	(800) 443-9353
	www.aws.org	(305) 443-9353
CGA	Compressed Gas Association	(703) 788-2700
	www.cganet.com	
CIMA	Cellulose Insulation Manufacturers Association	(888) 881-2462
	www.cellulose.org	(937) 222-2462
CSI	Construction Specifications Institute (The)	(800) 689-2900
	www.csinet.org	(703) 684-0300
EJMA	Expansion Joint Manufacturers Association, Inc.	(914) 332-0040
	www.ejma.org	
HI	Hydronics Institute	(908) 464-8200
	www.gamanet.org	
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association	(908) 464-8200
	Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI)	
	www.ahrinet.org	
IGMA	Insulating Glass Manufacturers Alliance	(613) 233-1510
	www.igmaonline.org	
ISA	Instrumentation, Systems, and Automation Society, The	(919) 549-8411
	www.isa.org	
ISO	International Organization for Standardization	41 22 749 01 11
	www.iso.ch	



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MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.	(703) 281-6613
	www.mss-hq.com	
NEBB	National Environmental Balancing Bureau	(301) 977-3698
	www.nebb.org	
NEMA	National Electrical Manufacturers Association	(703) 841-3200
	www.nema.org	
NFPA	NFPA	(800) 344-3555
	(National Fire Protection Association)	(617) 770-3000
	www.nfpa.org	
STI	Steel Tank Institute	(847) 438-8265
	www.steeltank.com	
TEMA	Tubular Exchanger Manufacturers Association	(914) 332-0040
	www.tema.org	
UL	Underwriters Laboratories Inc.	(877) 854-3577
	www.ul.com	(847) 272-8800

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ICC	International Code Council	(888) 422-7233
	www.iccsafe.org	
DOE	Department of Energy	(202) 586-9220
	www.energy.gov	
EPA	Environmental Protection Agency	(202) 272-0167
	www.epa.gov	

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FCC	Federal Communications Commission	(888) 225-5322
	<a href="http://www.fcc.gov">www.fcc.gov</a>	
OSHA	Occupational Safety & Health Administration	(800) 321-6742
	<a href="http://www.osha.gov">www.osha.gov</a>	(202) 693-1999
PHS	Office of Public Health and Science	(202) 690-7694
	<a href="http://www.hhs.gov/ophs/">http://www.hhs.gov/ophs/</a>	
USPS	Postal Service	(202) 268-2000
	<a href="http://www.usps.com">www.usps.com</a>	

- C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA)	(800) 872-2253
CFR	Code of Federal Regulations	(866) 512-1800
	Available from Government Printing Office	(202) 512-1800
	<a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>	

**1.05 CODES AND STANDARDS**

- A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. Where specific code requirements apply, they shall be included in the job, whether or not specifically shown or elsewhere specified.
- B. Applicable codes and standards shall include all state laws, local ordinances, utility company regulations, and the applicable requirements of the following adopted codes and standards.

1. Building Codes for Arkansas
  - a. International Building Code 2021
  - b. Arkansas Fuel Gas Code 2018
  - c. Arkansas Energy Code 2014 (based on ANSI/ASHRAE/IESNA Standard 90.1-2007)
  - d. Arkansas State Plumbing Code 2018

#### **1.06 CONFLICTING REQUIREMENTS**

- A. Conflicting requirements: If compliance with standards, codes, regulations, and specifications establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

#### **1.07 SPECIFICATION AND DRAWING CONVENTIONS**

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.
  4. The Plumbing Drawings show the general arrangement of all piping, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The work shall conform to the requirements shown on all of the drawings. General and Structural Drawings shall take precedence over Plumbing Drawings. Because of the small scale of the Plumbing Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, offsets, valves and accessories as may be required to meet such conditions.

#### **1.08 FEES, PERMITS, AND INSPECTIONS**

- A. All required fees, permits and inspections of all kind shall be obtained and paid for by the Contractor under the section of the specifications for which they are required.
- B. Certificate of Final Inspection: Under each applicable section of the specifications, the Contractor shall, upon completion of the work under that section, furnish a certificate of final inspection to the Engineer from the inspection department having jurisdiction.

#### **1.09 SUBMITTALS**

- A. Submittal Schedule
1. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering,

manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

- a. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
- b. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
- c. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - 1) Submit revised submittal schedule to reflect changes in current status and timing for submittals.
- d. Format: Arrange the following information in a tabular format:
  - 1) Scheduled date for first submittal.
  - 2) Specification Section number and title.
  - 3) Submittal category: Action; informational.
  - 4) Name of subcontractor.
  - 5) Description of the Work covered.
  - 6) Scheduled date for Engineer's final release or approval.

**B. Submittal Administrative Requirements**

1. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - a. Submit submittals to Engineer through the Architect.
  - b. Engineer, through Architect, will return annotated file.
2. Digital Data Files:
  - a. Electronic digital data files of the Project drawings may be provided by Engineer for Contractor's use in preparing submittals.
  - b. Electronic digital data files supplied for use in submittal preparation will be subject to terms and conditions of the Engineer's Release Form. A signed release form and any payment required must be returned to the Engineer prior to the transmission of an electronic digital data files.
  - c. Electronic digital data file formats may include AutoCAD drawings, Revit converted to AutoCAD drawings, or Revit model.
3. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

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- b. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - c. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  - d. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - 1) Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
4. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
- a. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  - b. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - c. Resubmittal Review: Allow 14 days for review of each resubmittal.
5. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
- a. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - b. Name file with submittal number or other unique identifier, including revision identifier.
    - 1) File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
  - c. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
  - d. Transmittal Form for Electronic Submittals: Use electronic form containing the following information:
    - 1) Project name.
    - 2) Name and address of Architect.
    - 3) Name and address of Engineer.

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- 4) Name of Construction Manager.
  - 5) Name of Contractor.
  - 6) Name of firm or entity that prepared submittal.
  - 7) Names of subcontractor, manufacturer, and supplier.
  - 8) Category and type of submittal.
  - 9) Submittal purpose and description.
  - 10) Specification Section number and title.
  - 11) Specification paragraph number or drawing designation and generic name for each of multiple items.
  - 12) Drawing number and detail references, as appropriate.
  - 13) Location(s) where product is to be installed, as appropriate.
6. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
  7. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
    - a. Note date and content of previous submittal.
    - b. Note date and content of revision in label or title block and clearly indicate extent of revision.
    - c. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
  8. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
  9. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.
  10. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
    - a. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
    - b. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor through Architect of approval or rejection of proposed comparable product request within 14 days

of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

- 1) Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

### **1.10 CLOSEOUT SUBMITTALS**

A. Closeout submittals shall include, but not limited to, the following:

1. Operation and Maintenance Materials
2. Record Drawings
3. Demonstration and Training Materials
4. Final Approved Submittals

B. Operation and Maintenance Materials Submittals

1. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - a. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
  - b. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
2. Format: Submit operations and maintenance manuals in the following format:
  - a. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
    - 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - 2) Enable inserted reviewer comments on draft submittals.
  - b. In addition to the electronic submit provide two paper copies of the corrected final submittal as part of the "Closeout Documents". Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Engineer, through Architect, will return two copies. The two paper copies will be provided to the Owner as part of the "Closeout Documents"
3. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 days before commencing demonstration and training. Engineer will return copy with comments.
  - a. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.



C. Training Submittals

1. Demonstration to the Owner personnel of the Plumbing products and systems to be utilized on the project is required.
2. Training of Owner personnel in operation and maintenance is required for:
  - a. Plumbing systems and equipment.
  - b. All software-operated systems.
  - c. Items specified in individual product Sections

D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
  - a. Manufacturer's catalog cuts.
  - b. Manufacturer's product specifications.
  - c. Standard color charts.
  - d. Statement of compliance with specified referenced standards.
  - e. Testing by recognized testing agency.
  - f. Application of testing agency labels and seals.
  - g. Notation of coordination requirements.
  - h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
  - a. Wiring diagrams showing factory-installed wiring.
  - b. Printed performance curves.
  - c. Operational range diagrams.
  - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale and sufficiently large to show all pertinent features of the item, method of connections, and notations clearly legible. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.

SECTION 22 00 00  
SUPPLEMENTARY PLUMBING GENERAL CONDITIONS

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
  - a. Identification of products.
  - b. Schedules.
  - c. Compliance with specified standards.
  - d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
  - f. Relationship and attachment to adjoining construction clearly indicated.
  - g. Seal and signature of professional engineer if specified.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 3100 "Project Management and Coordination."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents.  
  
Include evidence of manufacturing experience where required.

SECTION 22 00 00  
SUPPLEMENTARY PLUMBING GENERAL CONDITIONS

- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
  2. Date of evaluation.
  3. Time period when report is in effect.
  4. Product and manufacturers' names.
  5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- R. Pre-construction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

### **1.11 QUALITY ASSURANCE**

#### **A. Products:**

- 1. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - a. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - b. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

### **1.12 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project Site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation or moisture damage..
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.

### **1.13 PRODUCT WARRANTIES**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submit warranties in accordance with "Closeout Procedures."

### **1.14 FIELD CONDITIONS**

- A. The Contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause of extras after the contract is signed, by reason of unforeseen conditions.

### **1.15 WARRANTY**

- A. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the plumbing under guarantees outlined above for a period of 1 full year after acceptance by the Engineer and Owner. Regardless of anything to the contrary in warranties by the equipment manufacturer involved, the Contractor's warranty shall run for 1 full year after final acceptance by the Engineer.

## **PART 2 PRODUCTS**

### **2.01 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit 2 paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in

performing these services.

## **2.02 PRODUCT SELECTION PROCEDURES**

A. General Product Requirements: Provide products that comply with the Contract

Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Where two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
5. Where products are accompanied by the term "as selected," Architect will make selection.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
7. Products containing asbestos shall not be used.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience shall be considered.
  - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience shall be considered.
    - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
  5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Selection Procedure: Where Specifications include the phrase "as selected by Architect" or similar phrase, select a product that complies with requirements.
- Architect will select option from manufacturer's product line that includes both standard and premium items.
- D. Comparable Products
1. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
    - a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
    - b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - c. Evidence that proposed product provides specified warranty.
    - d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.



- e. Contractor is responsible for any modification required by products other than the basis of design product at no additional cost to the owner including but not limited to modifications to supports and connections

### **2.03 COORDINATION DRAWINGS**

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed valves and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  - 1. Floor Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, low voltage, and electrical work. Supplement plan drawings with section drawings where required to adequately represent the work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical, plumbing, fire protection, low voltage, and electrical equipment, and related work.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, low voltage, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  6. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  7. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  8. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: DXF operating in Microsoft Windows operating system.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and supply Portable Data File (PDF) format.

#### **2.04 EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

SECTION 22 00 00  
SUPPLEMENTARY PLUMBING GENERAL CONDITIONS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
- F. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- G. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for

minimum readable file size.

2. **File Names and Bookmarks:** Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

#### H. Operation Manual

1. **Content:** In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - a. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - b. Performance and design criteria if Contractor has delegated design responsibility.
  - c. Operating standards.
  - d. Operating procedures.
  - e. Operating logs.
  - f. Wiring diagrams.
  - g. Control diagrams.
  - h. Piped system diagrams.
  - i. Precautions against improper use.
  - j. License requirements including inspection and renewal dates.
2. **Descriptions:** Include the following:
  - a. Product name and model number. Use designations for products indicated on Contract Documents.
  - b. Manufacturer's name.
  - c. Equipment identification with serial number of each component.
  - d. Equipment function.
  - e. Operating characteristics.
  - f. Limiting conditions.
  - g. Performance curves.
  - h. Engineering data and tests.
  - i. Complete nomenclature and number of replacement parts.
3. **Operating Procedures:** Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Instructions on stopping.

- f. Normal shutdown instructions.
  - g. Seasonal and weekend operating instructions.
  - h. Required sequences for electric or electronic systems.
  - i. Special operating instructions and procedures.
4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- I. Maintenance Manuals
- 1. Content: Organize manual into a separate section for each product, system, subsystem, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
  - 2. Source Information: List each product, system, or subsystem included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
  - 3. Product Information: Include the following, as applicable:
    - a. Product name and model number.
    - b. Manufacturer's name.
    - c. Color, pattern, and texture.
    - d. Material and chemical composition.
    - e. Reordering information for specially manufactured products.
    - f. Standard maintenance instructions and bulletins.
    - g. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    - h. Identification and nomenclature of parts and components.
    - i. List of items recommended to be stocked as spare parts.
  - 4. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    - a. Inspection procedures.
    - b. Types of cleaning agents to be used and methods of cleaning.
    - c. List of cleaning agents and methods of cleaning detrimental to product.
    - d. Schedule for routine cleaning and maintenance.
    - e. Repair instructions.
    - f. Test and inspection instructions.
    - g. Troubleshooting guide.
    - h. Precautions against improper maintenance.
    - i. Disassembly; component removal, repair, and replacement; and reassembly instructions.

- j. Aligning, adjusting, and checking instructions.
- k. Demonstration and training video recording, if available.
- 5. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- 6. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - a. Include procedures to follow and required notifications for warranty claims.
- 7. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- 8. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- 9. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- 10. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - a. Include procedures to follow and required notifications for warranty claims.

## **2.05 RECORD DRAWINGS**

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

- 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
  - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an acceptable drawing technique.
  - c. Record and check the markup before enclosing concealed installations.
  - d. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Locations and depths of underground utilities.
    - d. Revisions to routing of piping and conduits.
    - e. Revisions to electrical circuitry.
    - f. Actual equipment locations.
    - g. Locations of concealed internal utilities.
    - h. Changes made by Change Order or Change Directive.
    - i. Changes made following Architect's written orders.
    - j. Details not on the original Contract Drawings.
    - k. Field records for variable and concealed conditions.
    - l. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark important additional information that was either shown schematically or omitted from original Drawings.
  5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Engineer for resolution.

## **2.06 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module.  
  
Include a description of specific skills and knowledge that participant is expected to

master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
  - a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project record documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.

### **PART 3 EXECUTION**

#### **3.01 CONTRACTOR'S SUBMITTAL REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract



Documents.

### **3.02 ENGINEER'S SUBMITTAL ACTION**

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to the Architect to forward to the appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

### **3.03 CONSTRUCTION WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Disposal: Remove waste materials from Owner's property and legally dispose of them

### **3.04 GENERAL COORDINATION FOR PLUMBING WORK**

SECTION 22 00 00  
SUPPLEMENTARY PLUMBING GENERAL CONDITIONS

- A. The Contractor shall compare the Plumbing Drawings and Specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the Plumbing Work. The Plumbing Work shall be installed in cooperation with other trades installing related work. Before installation, the Contractor shall make proper provision to avoid interferences. All changes required in the work of the Contractor caused by a failure to coordinate the work with other trades shall be made by the Contractor at his own expense.
- B. Anchor bolts, sleeves, inserts and supports that may be required for the Plumbing Work shall be furnished under the same section of the specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them, which trade shall also insure that they are properly installed. Any expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor under the section of the specifications for the trade with the responsibility for directing their proper location.
- C. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located, and shall do any cutting and patching caused by the neglect to do so. Slots, chases, openings and recesses in existing structure shall be cut by the trade requiring them and patched and repaired by that trade.

- D. Locations of pipes, equipment, etc. shall be adjusted to accommodate the work and to avoid interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe and duct prior to fabrication.
1. Right-of-Way: Lines which pitch shall have the right of way over those which do not pitch. For example: plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
  2. Offsets, transitions and changes in direction in pipes shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all traps, air vents, sanitary vents, etc., as required to effect these offsets, transitions and changes in direction.
  3. Installation and Arrangement: The Contractor shall install all Plumbing Work to permit removal (without damage to other parts) of coils, heat exchanger bundles, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The Contractor shall arrange pipes and equipment to permit ready access to valves, cocks, control components and to clear the openings of swinging and overhead doors and of access panels.
  4. Access: The Contractor shall provide all necessary access panels in walls, ceilings, equipment, etc., as required for inspection of interiors and for proper maintenance and or installation of equipment valves. Where changes from the plans are made by the Contractor in the installation of his work, he shall provide any and all access panels required as a result of these changes.
- E. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all incidental changes in piping, supports, insulation, etc. The Contractor shall provide any additional valves, fittings, and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be

responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.

F. Connections: All piping connecting to equipment shall be installed without strain at the piping connection

G. Inaccessible Equipment

1. Where the Engineer or Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action (such as providing access panels) performed as directed at no additional cost to the Owner.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

H. Electrical Coordination

1. Power: All power and motor wiring shall be performed under Division 26 unless otherwise noted for specific items. Control and interlock wiring shall be done by the Contractor of this Division.
  2. Starters and Drives: All motor starters and drives unless included in other sections of the specifications shall be by Division 26. Furnish auxiliary contacts on magnetic starters to permit interlocking of starting circuits.
  3. Disconnects: All equipment furnished under this Division required to have a means of disconnect shall be supplied with a disconnect or a disconnect shall be furnished and installed by Division 26. The Contractor shall coordinate between this Division and Division 26 to ensure that all disconnects required for the Project are furnished and installed.
  4. The Contractor of this Division shall furnish and install any low voltage relays, pressure switches, and similar items required for the proper operation of the Plumbing equipment.
- I. Dedicated Electrical Space: The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation.

No piping, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in foreign systems. Every effort shall be made to eliminate foreign systems above equipment to the structural ceiling. If this is not possible, the Contractor shall encase any pipe in a second pipe with a minimum number of joints.

### **3.05 EXCAVATION AND TRENCHING**

- A. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the drawings, or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other methods. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections. The Contractor shall be responsible for shoring all trenches in accordance with industry standards and local codes. The Contractor shall be liable for the safety of the workmen in the trench and observe safety rules at all times.
- B. Trench Excavation: Trenches shall be of necessity width for the proper laying of the piping, and the banks shall be as nearly vertical as practicable. The bottom of the

trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are required, the rock shall be excavated to a minimum overdepth of 4" below the trench depths indicated on the drawings or specified. Overdepths in the rock excavation and unauthorized overdepths shall be backfilled with loose, granular, moist earth, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel or other suitable material, as hereinafter specified.

- C. Depth of Cover: Trenches for utilities shall be of a depth that will provide the following minimum depths of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.
  - 1. 2 feet - 6 inches minimum cover: Hydronic piping.
- D. Excavations for Appurtenances: Excavation for tunnels and similar structures shall be sufficient to level at least 12" in the clear between their outer surfaces and the embankment or timbers which may be used to hold and protect the banks. Any overdepth excavation below such appurtenances shall be considered as unauthorized and shall be filled with sand, gravel, or concrete at the expense of the Contractor.
- E. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be

protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense.

F. Blasting will not be permitted.

G. Backfilling of Trenches

1. Trenches shall not be backfilled until all required pressure and other tests have been performed, witnessed by the Engineer, and until the utilities systems as installed confirm to the requirements of the drawings and specifications.
2. Normal Backfill: Where compacted backfill is not specified the trenches shall be carefully backfilled with the materials approved for backfilling (See appropriate section), deposited in 6" layers and thoroughly and carefully rammed until the pipe has a cover of not less than one foot. The remainder of the backfill material shall then be carefully placed in the trench in one foot layers and tamped. Settling the backfill with water will not be permitted. The surface shall be graded to a reasonable uniformity and the mounding over trenches left in a uniform and neat condition.
3. Compacted backfill shall be used under slabs on grade, building structure, concrete paving and asphaltic concrete paving. The soils used in the fill shall be granular in nature and shall not contain roots, sod, rubbish or stones over 1-1/2" maximum dimension.
  - a. Required Density
    - 1) All fills shall be compacted to a dry density equal to at least 90% of the maximum density determined in accordance with the Modified AASHO Method of Compaction. The maximum density and optimum moisture content shall be determined on the basis of laboratory tests conducted on the materials used in the fill.
    - 2) Modified AASHO Compaction Method provides that soil samples be compacted in 5 equal layers in a standard compaction cylinder having a volume of 1/30 cu. ft. using 25 18" blows of 10 pound rammer to compact each layer.
  - b. Control Tests: Adequacy of compaction shall be determined on the basis of in-place density determinations that are to be conducted while the fills are being placed. The results of these tests shall be the basis on which satisfactory completion of the work is judged. Should the fills fail to meet the specified densities, the Contractor shall remove and recompact the soils until the specified densities are achieved.
  - c. Equipment: The choice of compaction equipment shall be made by the Contractor; however, the equipment shall be adequate for achieving the

specified densities. Use of hand-operated, power-driven compaction equipment may be necessary at locations inaccessible to roller-type equipment.

### 3.06 PAINTING

A. The Contractor shall remove all rust, oil and grease from exposed surfaces and clean all apparatus or materials specified to be painted under this section of the specifications.

Contractor shall paint equipment, piping, etc., in accordance with Division 9.

Equipment specified to have factory finishes shall be protected until completion of the Contract, with Contractor being responsible for maintaining finishes.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
7. Do not paint piping specialties with factory-applied finish.
8. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
9. Galvanized surfaces damaged during installation shall be repaired with a galvanized repair compound complying with Mil Spec DOD-P-21035B. Any equipment scratched, marred or damaged will be repainted to the original condition.



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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior piping systems.
- C. Section 09 91 23 - Interior Painting: Preparation and painting of interior piping systems.
- D. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
- E. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Piping identification.
- F. Section 22 07 16 - Plumbing Equipment Insulation.
- G. Section 22 07 19 - Plumbing Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Valve Stem Packings: Two for each type and size of valve.

### **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 78 00 - Closeout Submittals, for additional warranty requirements.

## **PART 2 PRODUCTS**

### **2.01 PIPE SLEEVES**

- A. 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.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  1. Zinc coated or cast iron pipe.
  2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  1. Galvanized steel pipe or black iron pipe with asphalt coating.
  2. Connect sleeve with floor plate except in mechanical rooms.
- E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- F. Clearances:
  1. Provide allowance for insulated piping.
  2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

## **2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS**

- A. Modular/Mechanical Seal:
  1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  2. Provide watertight seal between pipe and wall/casing opening.
  3. Elastomer element size and material in accordance with manufacturer's recommendations.
  4. Glass reinforced plastic pressure end plates.

### **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. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 4. 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 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. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
  4. 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.

### **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.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Butterfly valves.
- E. Check valves.
- F. Gate valves.
- G. Globe valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- D. Section 22 07 19 - Plumbing Piping Insulation.
- E. Section 22 10 05 - Plumbing Piping.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.



- H. SWP: Steam working pressure.
- I. TFE: Tetrafluoroethylene.

#### **1.04 REFERENCE STANDARDS**

- A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding; 2017.
- B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- G. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- H. ASME B31.9 - Building Services Piping; 2017.
- I. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- J. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- K. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).
- L. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

- M. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- N. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015.
- O. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- P. AWWA C606 - Grooved and Shouldered Joints; 2015.
- Q. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
- R. MSS SP-67 - Butterfly Valves; 2017.
- S. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
- T. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- U. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- V. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- W. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- X. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- Y. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- Z. MSS SP-125 - Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves; 2018.
- AA.NSF 61 - Drinking Water System Components - Health Effects; 2019.
- BB.NSF 372 - Drinking Water System Components - Lead Content; 2016.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on valves including manufacturers catalog information.  
Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
  - 2. Protect valve parts exposed to piped medium against rust and corrosion.
  - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
  - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
  - 5. Secure check valves in either the closed position or open position.
  - 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.

- b. Maintain caps in place until installation.
- 2. Store valves in shipping containers and maintain in place until installation.
  - a. Store valves indoors in dry environment.
  - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

**1.08 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:**

- A. Avoid the use of operating handles or stems as rigging or lifting points.

**PART 2 PRODUCTS**

**2.01 APPLICATIONS**

- A. See drawings for specific valve locations.
- B. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: Ball, butterfly, gate.
  - 2. Dead-End: Single-flange butterfly (lug) type.
  - 3. Throttling: Provide globe, angle, ball, or butterfly.
- C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- D. Required Valve End Connections for Non-Wafer Types:
  - 1. Steel Pipe:
    - a. 2 NPS and Smaller: Threaded ends.
    - b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
    - c. Grooved-End Copper Tubing and Steel Piping: Grooved.
  - 2. Copper Tube:
    - a. 2 NPS and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
- E. Domestic, Hot and Cold Water Valves:
  - 1. 2 NPS and Smaller:
    - a. Bronze and Brass: Provide with solder-joint or threaded ends.
    - b. Bronze Angle: Class 125, bronze disc.
    - c. Ball: One piece, full port, brass or bronze with brass trim.
    - d. Bronze Swing Check: Class 125, bronze disc.
    - e. Bronze Gate: Class 125, NRS.
    - f. Bronze Globe: Class 125, bronze disc.

## 2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
  - 1. Gear Actuator: Quarter-turn valves 8 NPS and larger.
  - 2. Handwheel: Valves other than quarter-turn types.
  - 3. Hand Lever: Quarter-turn valves 6 NPS and smaller except plug valves.
  - 4. Wrench: Plug valves with square heads.
- D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:
  - 1. Gate Valves: Rising stem.
  - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
  - 3. Butterfly Valves: Extended neck.
  - 4. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
  - 3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
  - 4. Solder Joint Connections: ASME B16.18.
  - 5. Grooved End Connections: AWWA C606.
- F. General ASME Compliance:
  - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
  - 2. Solder-joint Connections: ASME B16.18.
  - 3. Building Services Piping Valves: ASME B31.9.
- G. Valve Materials for Potable Water: NSF 61 and NSF 372.
- H. Bronze Valves:
  - 1. Fabricate from dezincification resistant material.
  - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

### **2.03 BRASS BALL VALVES**

A. One-Piece, Reduced-Port with Brass Trim:

1. Comply with MSS SP-110.
2. CWP Rating: 600 psig.
3. Body: Forged brass.
4. Ends: Threaded.
5. Seats: PTFE or TFE.
6. Stem: Brass.
7. Ball: Chrome-plated brass.

B. Two Piece, Full Port with Brass Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE.
7. Stem: Brass.
8. Ball: Chrome-plated brass.

C. Three Piece, Full Port with Stainless Steel Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE or TFE.
7. Stem: Stainless steel.
8. Ball: Stainless steel, vented.

### **2.04 BRONZE BALL VALVES**

A. One Piece, Reduced Port with Bronze Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 400 psig.
3. CWP Rating: 600 psig.
4. Body: Bronze.
5. Ends: Threaded.

6. Seats: PTFE or TFE.
  7. Stem: Bronze.
  8. Ball: Chrome plated brass.
- B. Two Piece, Standard Port with Bronze Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 600 psig.
  4. Body: Bronze.
  5. Ends: Threaded.
  6. Seats: PTFE or TFE.
  7. Stem: Bronze.
  8. Ball: Chrome plated brass.
- C. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 600 psig.
  4. Body: Bronze.
  5. Ends: Threaded.
  6. Seats: PTFE or TFE
  7. Stem: Stainless steel.
  8. Ball: Stainless steel, vented.

## **2.05 STAINLESS STEEL BALL VALVES**

- A. One-Piece, Standard Port with Stainless-Steel Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 800 psig.
  4. Body: Stainless steel.
  5. Ends: Threaded.
  6. Seats: PTFE.
  7. Stem: Stainless steel.
  8. Ball: Stainless steel.
- B. Two Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 1000 psig.
  4. Body: Stainless steel.
  5. Seats: PFTE.

6. Stem: Stainless steel.
  7. Ball: Stainless steel.
- C. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 1000 psig.
  4. Body: Stainless steel.
  5. Seats: PTFE.
  6. Stem: Stainless steel.
  7. Ball: Stainless steel.
  8. Bolts: Stainless steel.

## **2.06 BRONZE LIFT CHECK VALVES**

A. Class 125:

1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
2. CWP Rating: 200 psig.
3. Design: Vertical flow.
4. Body: Comply with ASTM B61 or ASTM B62, bronze.
5. Ends: Threaded as indicated.
6. Disc (Type 1): Bronze.

## **2.07 BRONZE SWING CHECK VALVES**

A. Class 125: CWP Rating: 200 psig (1380 kPa) and Class 150: CWP Rating: 300 psig (2070 kPa).

1. Comply with MSS SP-80, Type 3.
2. Design: Horizontal flow.
3. Body: Bronze, ASTM B62.
4. Ends: Threaded as indicated.
5. Disc: Bronze.

## **2.08 BRONZE GATE VALVES**

A. Rising Stem (RS):

1. Comply with MSS SP-80, Type I.
2. Class 125: CWP Rating: 200 psig; and \_\_\_\_\_.
3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
4. Ends: Threaded or solder joint joint.



5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

## **2.09 BRONZE GLOBE VALVES**

- A. Class 125: CWP Rating: 200 psig: and Class 150: CWP Rating: 300 psig:
  1. Comply with MSS SP-80, Type 1.
  2. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
  3. Ends: Threaded joint.
  4. Stem: Bronze.
  5. Disc: Bronze, PTFE, or TFE.
  6. Packing: Asbestos free.
  7. Handwheel: Malleable Iron.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

### **3.02 INSTALLATION**

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

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GENERAL-DUTY VALVES FOR PLUMBING PIPING

- C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- D. Install check valves where necessary to maintain direction of flow as follows:
  - 1. Lift Check: Install with stem plumb and vertical.
  - 2. Swing Check: Install horizontal maintaining hinge pin level.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, piping, and other plumbing work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- K. 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.
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 30 00.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems and thermal insulated pipe supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- E. Installer's Qualifications: Include evidence of compliance with specified requirements.
- F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.06 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.07 DELIVERY, STORAGE, AND 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 MSS SP-58.

## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  3. Provide products listed, classified, and labeled as suitable for the 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 the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated 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. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
- C. Metal Channel (Strut) Framing Systems:
1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  2. Comply with MFMA-4.
  3. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
  5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
- D. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- E. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- 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 inch to 30 inch iron pipes.
  - d. Insulation inserts to consist of rigid phenolic foam 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 as indicated on drawings.
- F. Pipe Supports:
1. 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.
  2. 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.
- G. Pipe Stanchions: For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
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.
- H. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- I. Riser Clamps:
- J. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- K. Strut Clamps: Two-piece pipe clamp.



## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- L. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- M. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
  - 1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  - 2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- N. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
  - 1. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
- O. 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.
- P. Pipe Shields for Insulated Piping:
  - 1. 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.
- Q. 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 clamps, machine bolts, or welded threaded studs.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood: Use wood screws.
  - 9. Plastic and lead anchors are not permitted.
  - 10. Powder-actuated fasteners are permitted only as follows:
    - a. Where approved by Architect.
  - 11. Hammer-driven anchors and fasteners are not permitted.

## HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

12. 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. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
  - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

**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.
- 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 3 inch high concrete pad constructed in accordance with Section 03 30 00.
  - 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 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Seismic control requirements.
- C. Vibration isolators.
- D. Seismic restraint systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Section 03 30 00 - 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).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

**1.04 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).
- J. MFMA-4 - Metal Framing Standards Publication; 2004.
- K. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

**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. Seismic Controls:
  - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
  - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
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 30 00.

**1.06 SUBMITTALS**

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. 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.
- D. 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.
- E. Shop Drawings - Seismic Controls:
  - 1. Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
  - 2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  - 3. Indicate proposed arrangement of distributed system trapeze support groupings.
  - 4. Indicate proposed locations for distributed system flexible fittings and/or connections.
  - 5. Indicate locations of seismic separations where applicable.
- F. Seismic Design Data:
  - 1. Compile information on project-specific characteristics of actual installed plumbing components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
  - 2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- H. Evidence of qualifications for seismic controls designer.

**1.07 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. 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.
- D. 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 plumbing equipment and/or plumbing 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:

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

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.
3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

## D. 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.
  - c. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.

**2.02 SEISMIC CONTROL REQUIREMENTS**

- A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.
- B. Seismic Design Criteria: Obtain from project Structural Engineer of Record.
- C. Component Importance Factor ( $I_p$ ): Plumbing components essential to life safety to be assigned a component importance factor ( $I_p$ ) of 1.5 as indicated or as required. This includes but is not limited to:
  1. Plumbing components required to function for life safety purposes after an earthquake.
  2. Plumbing components that support or otherwise contain hazardous substances.
- D. Seismic Restraints:
  1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by



## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

authorities having jurisdiction.

2. Seismic Restraint Exemptions:

a. Exemptions for Seismic Design Category D, E, and F:

- 1) Discrete plumbing components that are positively attached to the structure where either of the following apply:
  - (a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor ( $I_p$ ) is 1.0.
  - (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
- 2) Plumbing piping with component importance factor ( $I_p$ ) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor ( $I_p$ ) of 1.5 and nominal pipe size of 1 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

b. Plumbing Piping Exemptions, All Seismic Design Categories:

- 1) Plumbing piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
  - (a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
  - (b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
  - (c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.

- (d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
  - (e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor ( $I_p$ ) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 412.
    - c. FEMA 413.
    - d. FEMA 414.
    - e. FEMA E-74.
    - f. SMACNA (SRM).
  4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
  5. Seismic Restraint Systems:
    - a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
    - b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.
    - c. Use only one restraint system type for a given plumbing component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
    - d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
- f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
- g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

## E. Seismic Attachments:

- 1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
- 2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
- 3. Do not use power-actuated fasteners.
- 4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
- 5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
- 6. Concrete Housekeeping Pads:
  - a. Increase size of pad as required to comply with anchor requirements.
  - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

## F. Seismic Interactions:

- 1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
- 2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

## G. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections to accommodate:
  - a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
  - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
  - c. Design displacements at seismic separations.
  - d. Anticipated drifts between floors.

**2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES****2.04 VIBRATION ISOLATORS**

## A. 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.

## B. 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.

**2.05 SEISMIC RESTRAINT SYSTEMS**

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- B. Cable Restraints:
  - 1. Comply with ASCE 19.
  - 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
  - 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
  - 4. Use protective thimbles for cable loops where potential for cable damage exists.
- C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

**PART 3 EXECUTION****3.01 CODE-REQUIRED SPECIAL INSPECTIONS**

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  - 1. Continuous Special Inspections: Special Inspection Agency 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 Inspections: Special Inspection Agency 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.
- C. Seismic special inspections include, but are not limited to:
  - 1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
  - 2. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

**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.
    - 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. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

## VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

## F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
  - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
  - a. Size in accordance with seismic design to meet anchor requirements.
  - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
  - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
  - b. Install restraints within permissible angles in accordance with seismic design.
  - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
  - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
  - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

- 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. Seismic Controls:
  - 1. Verify snubbing element air gaps.
- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.



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## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

### **1.02 RELATED REQUIREMENTS**

- A. Section 09 91 23 - Interior Painting: Identification painting.

### **1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

## **PART 2 PRODUCTS**

### **2.01 IDENTIFICATION APPLICATIONS**

- A. Heat Transfer Equipment: Nameplates.

- B. Piping: Pipe markers.
- C. Pumps: Nameplates.
- D. Small-sized Equipment: Tags.
- E. Tanks: Nameplates.
- F. Valves: Tags and ceiling tacks where located above lay-in ceiling.

## **2.02 NAMEPLATES**

- A. 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. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

## **2.04 PIPE MARKERS**

- A. Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Color code as follows:

1. Potable Water: Green with white letters.
2. Flammable Fluids: Yellow with black letters.
3. Combustible Fluids: Brown with white letters.
4. Compressed Air: Blue with white letters.

## **2.05 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
  1. Plumbing Valves: Green.

## **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 91 23 for stencil painting.

### **3.02 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.  
Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 91 23.
- 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. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. 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.

SECTION 22 05 53  
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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.
- H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 09 91 13 - Exterior Painting: Painting insulation jacket.
- C. Section 09 91 23 - Interior Painting: Painting insulation jacket.
- D. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

**1.03 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials;  
Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 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 or UL 723.

## 2.02 GLASS FIBER

### A. Manufacturers:

1. Johns Manville Corporation; Micro-Lok: [www.jm.com/#sle](http://www.jm.com/#sle).
2. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
3. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
4. Substitutions: See Section 01 60 00 - 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.

### 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-inches.

### 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. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

## 2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

### A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.



3. Connection: Waterproof vapor barrier adhesive.
- B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## **2.04 JACKETS**

- 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.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.
  - B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

## **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, and expansion joints.

- E. Install cellular melamine with factory-applied jackets with a manufacturer-approved adhesive along seams, both straight lap joints and circumferential lap joints.
  - 1. Install seal over seams with factory-approved room temperature vulcanization (RTV) silicone sealant to ensure a positive vapor barrier seal in outdoor and sanitary washdown environments.
- F. 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.
- G. 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.
- 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.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

- 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.

### 3.03 SCHEDULES

#### A. Plumbing Systems:

- 1. Domestic Cold Water:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: All Sizes.
      - (a) Thickness: 1/2 inch.
- 2. Domestic Hot Water Supply and Hot Water Recirculation:
  - a. Glass Fiber Insulation:
    - 1) Pipe Size Range: NPS Smaller than 1-1/2" r.
      - (a) Thickness: 1 inch.
    - 2) Pipe Size Range: NPS 1-1/2" and Larger.
      - (a) Thickness: 1-1/2" inch.
- 3. Roof Drainage Run Horizontal at Roof Level: 1"

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Chemical resistant sewer.
  - 3. Domestic water.
  - 4. Storm water.
  - 5. Flanges, unions, and couplings.
  - 6. Pipe hangers and supports.
  - 7. Manufactured sleeve-seal systems.
  - 8. Valves.
  - 9. Flow controls.
  - 10. Check.
  - 11. Relief valves.
  - 12. Strainers.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- B. Section 22 07 19 - Plumbing Piping Insulation.
- C. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- E. ASME B31.9 - Building Services Piping; 2017.

- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2019.
- G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.
- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- J. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- K. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- P. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).
- Q. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

- R. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).
- S. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.
- T. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.
- U. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- V. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- W. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2015.
- X. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.
- Y. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.
- Z. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2015.
- AA. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2019.
- BB. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014.

CC. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2014.

DD. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2016.

EE. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

FF. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

GG. AWWA C606 - Grooved and Shouldered Joints; 2015.

HH. AWWA C651 - Disinfecting Water Mains; 2014.

II. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.

JJ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

KK. MSS SP-67 - Butterfly Valves; 2017.

LL. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

MM. NSF 61 - Drinking Water System Components - Health Effects; 2019.

NN. NSF 372 - Drinking Water System Components - Lead Content; 2016.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.  
Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.

- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### **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. 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.
- 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, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

## **2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
  - 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
  - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## **2.03 SANITARY SEWER PIPING, ABOVE GRADE**

- A. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
  - 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
  - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- B. PVC Pipe: ASTM D2729.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## **2.04 CHEMICAL RESISTANT SEWER PIPING**

- A. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
  - 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
  - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

## **2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Copper Pipe: ASTM B42, Type K, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze.

## **2.06 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
  - 3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

## **2.07 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
  - 1. Fittings: PVC.
  - 2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

## **2.08 STORM WATER PIPING, ABOVE GRADE**

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## **2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: ASME B31.1, welded.
  - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

## **2.10 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.

## **2.11 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 Inches and Under:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
  - 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
  2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
  3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
  4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## **2.12 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.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  4. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  5. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
  6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

- C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  2. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  3. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

### **2.13 MANUFACTURED SLEEVE-SEAL SYSTEMS**

- A. Modular/Mechanical Seal:
1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  2. Provide watertight seal between pipe and wall/casing opening.
  3. Elastomer element size and material in accordance with manufacturer's recommendations.
  4. Glass reinforced plastic pressure end plates.

### **2.14 BALL VALVES**

- A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

### **2.15 BUTTERFLY VALVES**

- A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

### **2.16 PIPING SPECIALTIES**

- A. Flow Controls:
1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
  2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum

minimum pressure 3.5 psi.

## **2.17 RELIEF VALVES**

### **A. Temperature and Pressure:**

1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

## **2.18 STRAINERS**

### **A. Size 2 Inches and Under:**

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

### **B. Size 1-1/2 inch to 4 inches:**

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- #### **A. Verify that excavations are to required grade, dry, and not over-excavated.**

### **3.02 PREPARATION**

- #### **A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.**
- #### **B. Remove scale and dirt, on inside and outside, before assembly.**
- #### **C. Prepare piping connections to equipment with flanges or unions.**

### **3.03 INSTALLATION**

- #### **A. Install in accordance with manufacturer's instructions.**
- #### **B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.**
- #### **C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.**

- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
  - 1. Refer to Section 22 07 19.
- H. Provide access where valves and fittings are not exposed.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- 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. Install bell and spigot pipe with bell end upstream.
- M. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- 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.
- 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. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  7. Provide copper plated hangers and supports for copper piping.
  8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  9. Support cast iron drainage piping at every joint.
- T. 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 watertight seal.
  6. Install in accordance with manufacturer's recommendations.
- U. 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.

- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.
- E. Provide flow controls in water recirculating systems where indicated.

### **3.05 TOLERANCES**

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

### **3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 33 01 10.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### **3.07 SERVICE CONNECTIONS**



- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

### 3.08 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.
    - c. Pipe Size: 2-1/2 inches to 3 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 1/2 inch.
  - 2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Cleanouts.
- B. Hose bibbs.
- C. Refrigerator valve and recessed box.
- D. Backflow preventers.
- E. Double check valve assemblies.
- F. Water hammer arrestors.
- G. Mixing valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 30 00 - Plumbing Equipment.
- C. Section 22 40 00 - Plumbing Fixtures.

**1.03 REFERENCE STANDARDS**

- A. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2009.
- B. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- D. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- E. PDI-WH 201 - Water Hammer Arresters; 2017.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Manufacturer's Qualification Statement.
- F. Operation Data: Indicate frequency of treatment required for interceptors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- H. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, \_\_\_\_\_.

### **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 BACKFLOW PREVENTERS**

- A. Reduced Pressure Backflow Preventers:
  - 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential

pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

### **2.03 DOUBLE CHECK VALVE ASSEMBLIES**

#### A. Manufacturers:

1. Substitutions: See Section 01 60 00 - Product Requirements.

#### B. Double Check Valve Assemblies:

1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

### **2.04 WATER HAMMER ARRESTORS**

#### A. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

### **2.05 MIXING VALVES**

#### A. Thermostatic Mixing Valves:

1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
2. Accessories:
  - a. Check valve on inlets.
  - b. Volume control shut-off valve on outlet.
  - c. Stem thermometer on outlet.
  - d. Strainer stop checks on inlets.

### **2.06 RELIEF VALVES**

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

### **2.07 AIR VENTS**

A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

C. Washer Type:

1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

**2.08 FLOOR DRAIN TRAP SEALS**

- A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

**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. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to fixture.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe and pipe fittings.
- B. Air compressor.
- C. Air receiver and accessories.
- D. Refrigerated air dryer.
- E. Pressure reducing station.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Identification of piping system.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- D. ASME B31.1 - Power Piping; 2022.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.
- F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- G. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

- H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.
- B. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, hoisting and setting requirements, starting procedures.
- D. Operation Data: Submit for air compressor, air receiver, and accessories, aftercooler, refrigerated air dryer, and pressure reducing station.
- E. Maintenance Data: Submit for air compressor, air receiver, and accessories, aftercooler, refrigerated air dryer, and pressure reducing station.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Project Record Documents: Record actual locations of equipment and components. Modify shop drawings to indicate final locations.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Compressor Oil: One container, quart size.



### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept air compressors, refrigerated air dryer on site in factory-fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.
- B. Protect piping and equipment from weather and construction traffic.

### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reciprocating air compressors.

## **PART 2 PRODUCTS**

### **2.01 PIPE AND PIPE FITTINGS**

- 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. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, solder, Grade Sn95.

### **2.02 AIR OUTLETS**

- A. Quick Connector: 3/8 inch brass, snap-on connector with self closing valve, Style A.

### **2.03 UNIONS AND COUPLINGS**

- A. Unions:
  - 1. Ferrous Pipe: 150 psi malleable iron threaded unions.
  - 2. Copper Tube and Pipe: 150 psi bronze unions with soldered joints.

- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- C. Flexible Connector: Neoprene with brass threaded connectors.

#### **2.04 COMPRESSOR**

- A. Type: Simplex compressor unit consisting of air cooled compressor, air receiver, aftercooler, refrigerated air dryer.
- B. Controls:
  - 1. Pressure Switch: Line voltage contactor to break at 100 psi with minimum differential of 20 psi.
  - 2. Compressor Regulation: Lead-lag switch with time delay relay.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.
- E. Cord and Plug: Provide unit with 6 foot cord and plug for connection to electric wiring system including grounding connector.

#### **2.05 AIR DRYER**

- A. Type: Self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.
- B. Air Connections: Inlet and outlet connections at same level, factory insulated.
- C. Heat Exchangers: Air to air and refrigerant to air coils. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no-load condition.
- D. Moisture Separator: Centrifugal type located at discharge of heat exchanger.

- E. Refrigeration Unit: Hermetically sealed type to operate continuously to maintain specified 21 degrees F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
- F. Accessories: Air inlet temperature gauge, air inlet pressure gauge, on/off switch, high temperature light, power on light, refrigerant gauge, air outlet temperature gauge, air outlet pressure gauge.

## **2.06 AIR RECEIVER**

- A. Receiver: Vertical, built to ASME regulations for working pressure of 125 psi. Flange or screw inlet and outlet connections.
- B. Fittings: Adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic float actuated condensate trap.
- C. Tank Finish: Shop primed.

## **2.07 PRESSURE REDUCING VALVE**

- A. Pressure Reducing Station: Consisting of automatic reducing valve and bypass, and low pressure side relief valve and gauge. Provide oil separator where indicated.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install equipment in accordance with manufacturer's instructions.
- B. Install compressor unit on vibration isolators. Level and bolt in place. Refer to Section 22 05 48.
- C. Make air cock and drain connection on horizontal casing.
- D. Install line size gate valve and check valve on compressor discharge. Refer to Section 22 05 23.

- E. Install replaceable cartridge type filter silencer of adequate capacity for each compressor.
- F. Place shut off valve on water inlet to aftercooler. Pipe drain to floor drain. Refer to Section 22 05 23.
- G. Connect condensate drains to nearest floor drain.
- H. Install valved bypass around air dryer. Factory insulate inlet and outlet connections. Refer to Section 22 05 23.
- I. Install valved drip connections at low points of piping system. Refer to Section 22 05 23.
- J. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.
- K. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.
- L. Install tees instead of elbows at changes in direction of piping. Fit open end of each tee with plug.
- M. Identify piping system and components. Refer to Section 22 05 53.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
- C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.
- D. Cap and seal ends of piping when not connected to mechanical equipment.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Water Heaters
  - 1. Commercial gas fired.
- B. In-line circulator pumps.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
  - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- D. Project Record Documents: Record actual locations of components.

- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Certifications:
- C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

#### **1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

### **PART 2 - PRODUCTS**

## 2.01 WATER HEATERS

### A. Commercial Gas Fired:

1. Type: Automatic, natural gas-fired, vertical storage.
2. Performance:
  - a. Refer to equipment schedules.
3. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
4. Accessories:
  - a. Water Connections: Brass.
  - b. Dip Tube: Brass.
  - c. Drain valve.
  - d. Anode: Magnesium.
  - e. Temperature and Pressure Relief Valve: ASME labeled.
5. Certified For The Following Applications:
  - a. For operation at 180 degrees F.
6. Controls: Automatic direct immersion thermostat with temperature range adjustable minimum 175 degrees F differential, automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, intermittent electronic ignition monitoring pilot and main flame, trial for re-ignition for momentary loss of flame, shutdown of pilot and main burner in "2 to 4" seconds after loss of flame, and automatic flue damper.

## 2.02 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- B. Impeller: Noryl.
- C. Shaft: Ceramic with integral thrust collar and two oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling.

## 2.03 ELECTRICAL WORK



- A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.
- B. Electrical characteristics to be as specified or indicated.
- C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.
- D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Pumps:
  - 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
  - 2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

**PART 1 - GENERAL**

**1.01 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 10 06 - Plumbing Piping Specialties.
- C. Section 22 30 00 - Plumbing Equipment.
- D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2017).
- C. FM (AG) - FM Approval Guide; current edition.
- D. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.; 2013.
- E. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- F. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- G. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.
- H. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.
- I. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2017.
- J. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009).

- K. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- L. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- M. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- N. UL (DIR) - Online Certifications Directory; Current Edition.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

### **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.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### **1.06 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Refer to plumbing schedules on plumbing drawings for fixture requirements.
- C. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

### **2.02 REGULATORY REQUIREMENTS**

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### **3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

### **3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

### **3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

## **PART 1 GENERAL**

### **1.01 RELATED DOCUMENTS**

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

### **1.02 SUMMARY**

- A. Section includes supplementary general requirements for the following :
1. Codes and Standards
  2. Conflicting Requirements
  3. Specifications and Drawing Conventions
  4. Fees, Permits, and Inspection
  5. Submittals
  6. Closeout Submittals
  7. Quality Assurance
  8. Product Delivery, Storage, and Handling
  9. Product Warranties
  10. Product Selection Procedures
  11. Delegated Design
  12. Coordination Drawings
  13. Emergency, Operation, and Maintenance Manuals
  14. Record Drawings
  15. Construction Waste
  16. General Coordination for HVAC Work
  17. Cutting and Patching
  18. Painting

### **1.03 DEFINITIONS**

- A. "Action Submittals": Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

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- C. "Basis-of-Design Product": A product in which a specific manufacturer's product is named on the drawings or is accompanied by the words "basis-of-design product" in the specifications, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- D. "Construction Waste": Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- E. "Cutting": Removal of in-place construction necessary to permit installation or performance of other work.
- F. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- G. "Disposal": Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- H. "File Transfer Protocol (FTP)": Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- I. "Furnish": To supply, deliver, unload, and inspect for damage.
- J. "General": Basic Contract definitions are included in the Conditions of the Contract.

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- K. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- L. "Informational Submittals": Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- M. "Install": To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- N. "Patching": Fitting and repair work required to restore construction to original conditions after installation of other work.
- O. "Portable Document Format (PDF)": An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- P. "Product": Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Product may be new, never before used, or re-used materials or equipment.
- Q. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- R. "Provide": Furnish and install, complete and ready for the intended use.



- S. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- T. "Salvage": Recovery of construction waste and subsequent sale or reuse in another facility.
- U. "Salvage and Reuse": Recovery of construction waste and subsequent incorporation into the Work.
- V. "System": An organized collection of parts, equipment, or subsystems united by regular interaction.
- W. "Subsystem": A portion of a system with characteristics similar to a system.

**1.04 ABBREVIATIONS AND ACRONYMS**

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AGA	American Gas Association www.aga.org	(202) 824-7000
AHRI	Air Conditioning, Heating, and Refrigeration Institute www.ahrinet.org	(703) 524-8800
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AMCA	Air Movement and Control Association International, nc.	(847) 394-0150

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	www.amca.org	
ANSI	American National Standards Institute	(202) 293-8020
	www.ansi.org	
ARI	Air-Conditioning & Refrigeration Institute	(703) 524-8800
	www.ari.org	
ASCE	American Society of Civil Engineers	(800) 548-2723
	www.asce.org	(703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723
	www.ashrae.org	(404) 636-8400
ASME	ASME International	(800) 843-2763
	(American Society of Mechanical Engineers International)	(973) 882-1170
	www.asme.org	
ASTM	ASTM International	(610) 832-9500
	(American Society for Testing and Materials International)	
	www.astm.org	
AWS	American Welding Society	(800) 443-9353
	www.aws.org	(305) 443-9353
CGA	Compressed Gas Association	(703) 788-2700
	www.cganet.com	
CIMA	Cellulose Insulation Manufacturers Association	(888) 881-2462
	www.cellulose.org	(937) 222-2462
CSI	Construction Specifications Institute (The)	(800) 689-2900
	www.csinet.org	(703) 684-0300
EJMA	Expansion Joint Manufacturers Association, Inc.	(914) 332-0040
	www.ejma.org	

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HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) www.ahrinet.org	(908) 464-8200
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ISA	Instrumentation, Systems, and Automation Society, The www.isa.org	(919) 549-8411
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association	(703) 803-2980

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	www.smacna.org	

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ICC	International Code Council	(888) 422-7233
	www.iccsafe.org	

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DOE	Department of Energy	(202) 586-9220
	www.energy.gov	
EPA	Environmental Protection Agency	(202) 272-0167
	www.epa.gov	
FCC	Federal Communications Commission	(888) 225-5322
	www.fcc.gov	
OSHA	Occupational Safety & Health Administration	(800) 321-6742
	www.osha.gov	(202) 693-1999
PHS	Office of Public Health and Science	(202) 690-7694
	http://www.hhs.gov/ophs/	
USPS	Postal Service	(202) 268-2000
	www.usps.com	

- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA)	(800) 872-2253
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### 1.05 CODES AND STANDARDS

- A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. Where specific code requirements apply, they shall be included in the job, whether or not specifically shown or elsewhere specified.
- B. Applicable codes and standards shall include all state laws, local ordinances, utility company regulations, and the applicable requirements of the following adopted codes and standards.
1. Building Codes for Arkansas
    - a. International Building Code 2021
    - b. Arkansas Fire Prevention Code 2021
    - c. National Electrical Code 2020
    - d. Arkansas Energy Code 2014 (based on ANSI/ASHRAE/IESNA Standard 90.1-2007)
    - e. Arkansas State Plumbing Code 2018
    - f. Arkansas Mechanical Code 2021

### 1.06 CONFLICTING REQUIREMENTS

- A. Conflicting requirements: If compliance with standards, codes, regulations, and specifications establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting

requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

- B. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

### **1.07 SPECIFICATION AND DRAWING CONVENTIONS**

- A. **Specification Content:** The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. **Division 01 General Requirements:** Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. **Drawing Coordination:** Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. **Terminology:** Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. **Abbreviations:** Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. **Keynoting:** Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

4. The HVAC Drawings show the general arrangement of all piping, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The work shall conform to the requirements shown on all of the drawings. General and Structural Drawings shall take precedence over HVAC Drawings. Because of the small scale of the HVAC Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, offsets, valves and accessories as may be required to meet such conditions.

#### **1.08 FEES, PERMITS, AND INSPECTIONS**

- A. All required fees, permits and inspections of all kind shall be obtained and paid for by the Contractor under the section of the specifications for which they are required.
- B. Certificate of Final Inspection: Under each applicable section of the specifications, the Contractor shall, upon completion of the work under that section, furnish a certificate of final inspection to the Engineer from the inspection department having jurisdiction.

#### **1.09 SUBMITTALS**

- A. Submittal Schedule
  1. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
    - a. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
    - b. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
    - c. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      - 1) Submit revised submittal schedule to reflect changes in current status and timing for submittals.

- d. Format: Arrange the following information in a tabular format:
    - 1) Scheduled date for first submittal.
    - 2) Specification Section number and title.
    - 3) Submittal category: Action; informational.
    - 4) Name of subcontractor.
    - 5) Description of the Work covered.
    - 6) Scheduled date for Engineer's final release or approval.
- B. Submittal Administrative Requirements
- 1. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
    - a. Submit submittals to Engineer through the Architect.
    - b. Engineer, through Architect, will return annotated file.
  - 2. Digital Data Files:
    - a. Electronic digital data files of the Project drawings may be provided by Engineer for Contractor's use in preparing submittals.
    - b. Electronic digital data files supplied for use in submittal preparation will be subject to terms and conditions of the Engineer's Release Form. A signed release form and any payment required must be returned to the Engineer prior to the transmission of an electronic digital data files.
    - c. Electronic digital data file formats may include AutoCAD drawings, Revit converted to AutoCAD drawings, or Revit model.
  - 3. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
    - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    - b. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
    - c. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
    - d. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      - 1) Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  - 4. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing,



including resubmittals.

- a. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.  
Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  - b. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - c. Resubmittal Review: Allow 14 days for review of each resubmittal.
5. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
- a. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - b. Name file with submittal number or other unique identifier, including revision identifier.
    - 1) File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
  - c. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
  - d. Transmittal Form for Electronic Submittals: Use electronic form containing the following information:
    - 1) Project name.
    - 2) Name and address of Architect.
    - 3) Name and address of Engineer.
    - 4) Name of Contractor.
    - 5) Name of firm or entity that prepared submittal.
    - 6) Names of subcontractor, manufacturer, and supplier.
    - 7) Category and type of submittal.
    - 8) Submittal purpose and description.
    - 9) Specification Section number and title.
    - 10) Specification paragraph number or drawing designation and generic name for each of multiple items.
    - 11) Drawing number and detail references, as appropriate.
    - 12) Location(s) where product is to be installed, as appropriate.
    - 13) Transmittal number.
    - 14) Submittal and transmittal distribution record.
    - 15) Other necessary identification.
    - 16) Remarks.

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- e. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - 1) Project name.
  - 2) Number and title of appropriate Specification Section.
  - 3) Manufacturer name.
  - 4) Product name.
6. Options: Identify options requiring selection by Engineer.
7. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
8. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - a. Note date and content of previous submittal.
  - b. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - c. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
9. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
10. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.
11. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - a. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - b. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor through Architect of approval or rejection of proposed comparable product request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    - 1) Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

## 1.10 CLOSEOUT SUBMITTALS

- A. Closeout submittals shall include, but not limited to, the following:
1. Operation and Maintenance Materials
  2. Record Drawings
  3. Demonstration and Training Materials
  4. Final Approved Submittals
- B. Operation and Maintenance Materials Submittals
1. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
    - a. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
    - b. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
  2. Format: Submit operations and maintenance manuals in the following format:
    - a. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
      - 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      - 2) Enable inserted reviewer comments on draft submittals.
    - b. In addition to the electronic submit provide two paper copies of the corrected final submittal as part of the “Closeout Documents”. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Engineer, through Architect, will return two copies. The two paper copies will be provided to the Owner as part of the “Closeout Documents”
  3. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 days before commencing demonstration and training. Engineer will return copy with comments.
    - a. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.
- C. Training Submittals
1. Demonstration to the Owner personnel of the HVAC products and systems to be utilized on the project is required.

2. Training of Owner personnel in operation and maintenance is required for:
  - a. HVAC systems and equipment.
  - b. All software-operated systems.
  - c. Items specified in individual product Sections
- D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale and sufficiently large to show all pertinent features of the item, method of connections, and notations clearly legible. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.
  1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.

- d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
  - f. Relationship and attachment to adjoining construction clearly indicated.
  - g. Seal and signature of professional engineer if specified.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 3100 "Project Management and Coordination."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents.

- Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
  2. Date of evaluation.
  3. Time period when report is in effect.
  4. Product and manufacturers' names.
  5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- S. Pre-construction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

### **1.11 QUALITY ASSURANCE**

#### **A. Products:**

- 1. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - a. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - b. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

### **1.12 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project Site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation or moisture damage..
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.

### **1.13 PRODUCT WARRANTIES**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submit warranties in accordance with "Closeout Procedures."

### **1.14 FIELD CONDITIONS**



- A. The Contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause of extras after the contract is signed, by reason of unforeseen conditions.

### **1.15 WARRANTY**

- A. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the HVAC under guarantees outlined above for a period of 1 full year after acceptance by the Engineer and Owner. Regardless of anything to the contrary in warranties by the equipment manufacturer involved, the Contractor's warranty shall run for 1 full year after final acceptance by the Engineer.

## **PART 2 PRODUCTS**

### **2.01 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit 2 paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in

performing these services.

## **2.02 PRODUCT SELECTION PROCEDURES**

A. General Product Requirements: Provide products that comply with the Contract

Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Where two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
5. Where products are accompanied by the term "as selected," Architect will make selection.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
7. Products containing asbestos shall not be used.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience shall be considered.
  - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience shall be considered.
    - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
  5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Selection Procedure: Where Specifications include the phrase "as selected by Architect" or similar phrase, select a product that complies with requirements.
- Architect will select option from manufacturer's product line that includes both standard and premium items.
- D. Comparable Products
1. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
    - a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
    - b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - c. Evidence that proposed product provides specified warranty.
    - d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

- e. Contractor is responsible for any modification required by products other than the basis of design product at no additional cost to the owner including but not limited to modifications to supports and connections,

### **2.03 COORDINATION DRAWINGS**

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed valves and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, low voltage, and electrical work. Show locations of visible ceiling mounted devices relative to acoustical

ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical, plumbing, fire protection, low voltage, and electrical equipment, and related work.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, low voltage, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  6. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  7. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  8. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: DXF operating in Microsoft Windows operating system.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and supply Portable Data File (PDF) format.

## **2.04 EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
- F. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- G. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

#### H. Operation Manual

1. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - a. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - b. Performance and design criteria if Contractor has delegated design responsibility.
  - c. Operating standards.
  - d. Operating procedures.
  - e. Operating logs.
  - f. Wiring diagrams.
  - g. Control diagrams.
  - h. Piped system diagrams.
  - i. Precautions against improper use.
  - j. License requirements including inspection and renewal dates.
2. Descriptions: Include the following:
  - a. Product name and model number. Use designations for products indicated on Contract Documents.
  - b. Manufacturer's name.
  - c. Equipment identification with serial number of each component.
  - d. Equipment function.
  - e. Operating characteristics.
  - f. Limiting conditions.
  - g. Performance curves.
  - h. Engineering data and tests.
  - i. Complete nomenclature and number of replacement parts.
3. Operating Procedures: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.

- d. Regulation and control procedures.
  - e. Instructions on stopping.
  - f. Normal shutdown instructions.
  - g. Seasonal and weekend operating instructions.
  - h. Required sequences for electric or electronic systems.
  - i. Special operating instructions and procedures.
4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- I. Maintenance Manuals
1. Content: Organize manual into a separate section for each product, system, subsystem, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
  2. Source Information: List each product, system, or subsystem included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
  3. Product Information: Include the following, as applicable:
    - a. Product name and model number.
    - b. Manufacturer's name.
    - c. Color, pattern, and texture.
    - d. Material and chemical composition.
    - e. Reordering information for specially manufactured products.
    - f. Standard maintenance instructions and bulletins.
    - g. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    - h. Identification and nomenclature of parts and components.
    - i. List of items recommended to be stocked as spare parts.
  4. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    - a. Inspection procedures.
    - b. Types of cleaning agents to be used and methods of cleaning.
    - c. List of cleaning agents and methods of cleaning detrimental to product.
    - d. Schedule for routine cleaning and maintenance.
    - e. Repair instructions.
    - f. Test and inspection instructions.
    - g. Troubleshooting guide.
    - h. Precautions against improper maintenance.



- i. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- j. Aligning, adjusting, and checking instructions.
- k. Demonstration and training video recording, if available.
5. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
6. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - a. Include procedures to follow and required notifications for warranty claims.
7. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
8. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
9. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
10. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - a. Include procedures to follow and required notifications for warranty claims.

## **2.05 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record and check the markup before enclosing concealed installations.

- d. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
  - a. Dimensional changes to Drawings.
  - b. Revisions to details shown on Drawings.
  - c. Locations and depths of underground utilities.
  - d. Revisions to routing of piping and conduits.
  - e. Revisions to electrical circuitry.
  - f. Actual equipment locations.
  - g. Duct size and routing.
  - h. Locations of concealed internal utilities.
  - i. Changes made by Change Order or Change Directive.
  - j. Changes made following Architect's written orders.
  - k. Details not on the original Contract Drawings.
  - l. Field records for variable and concealed conditions.
  - m. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark important additional information that was either shown schematically or omitted from original Drawings.
5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## **2.06 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

- a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project record documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.

### **PART 3 EXECUTION**

#### **3.01 CONTRACTOR'S SUBMITTAL REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### **3.02 ENGINEER'S SUBMITTAL ACTION**

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to the Architect to forward to the appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

### **3.03 CONSTRUCTION WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Disposal: Remove waste materials from Owner's property and legally dispose of them

### **3.04 GENERAL COORDINATION FOR HVAC WORK**

- A. The Contractor shall compare the HVAC Drawings and Specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the

HVAC Work. The HVAC Work shall be installed in cooperation with other trades installing related work. Before installation, the Contractor shall make proper provision to avoid interferences. All changes required in the work of the Contractor caused by a failure to coordinate the work with other trades shall be made by the Contractor at his own expense.

- B. Anchor bolts, sleeves, inserts and supports that may be required for the HVAC Work shall be furnished under the same section of the specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them, which trade shall also insure that they are properly installed. Any expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor under the section of the specifications for the trade with the responsibility for directing their proper location.
- C. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located, and shall do any cutting and patching caused by the neglect to do so. Slots, chases, openings and recesses in existing structure shall be cut by the trade requiring them and patched and repaired by that trade.
- D. Locations of pipes, ductwork, equipment, etc. shall be adjusted to accommodate the work and to avoid interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe and duct prior to fabrication.

SECTION 23 00 00  
SUPPLEMENTARY HVAC GENERAL CONDITIONS

1. Right-of-Way: Lines which pitch shall have the right of way over those which do not pitch. For example: plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
  2. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all traps, air vents, sanitary vents, etc., as required to effect these offsets, transitions and changes in direction.
  3. Installation and Arrangement: The Contractor shall install all HVAC Work to permit removal (without damage to other parts) of coils, heat exchanger bundles, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The Contractor shall arrange pipes, ducts, and equipment to permit ready access to valves, cocks, control components and to clear the openings of swinging and overhead doors and of access panels.
  4. Ductwork: The Contractor shall change the cross-sectional dimensions of ductwork when required to meet job conditions but shall maintain at least the same equivalent cross-sectional area. The Contractor shall secure the approval of the Engineer prior to fabrication of ductwork requiring such changes.
  5. Access: The Contractor shall provide all necessary access panels in walls, ceilings, equipment, ducts. etc., as required for inspection of interiors and for proper maintenance and or installation of equipment valves. Where changes from the plans are made by the Contractor in the installation of his work, he shall provide any and all access panels required as a result of these changes.
- E. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all incidental changes in piping, ductwork, supports, insulation, etc. The Contractor shall provide any additional valves, fittings, and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be

responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.

F. Connections: All piping connecting to equipment shall be installed without strain at the piping connection

G. Inaccessible Equipment

1. Where the Engineer or Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action (such as providing access panels) performed as directed at no additional cost to the Owner.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

H. Electrical Coordination

1. Power: All power and motor wiring shall be performed under Division 26 unless otherwise noted for specific items. Control and interlock wiring shall be done by the Contractor of this Division.
  2. Starters and Drives: All motor starters and drives unless included in other sections of the specifications shall be by Division 26. Furnish auxiliary contacts on magnetic starters to permit interlocking of starting circuits.
  3. Disconnects: All equipment furnished under this Division required to have a means of disconnect shall be supplied with a disconnect or a disconnect shall be furnished and installed by Division 26. The Contractor shall coordinate between this Division and Division 26 to ensure that all disconnects required for the Project are furnished and installed.
  4. The Contractor of this Division shall furnish and install any low voltage relays, pressure switches, and similar items required for the proper operation of the HVAC equipment.
- I. Dedicated Electrical Space: The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation.

No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in foreign systems.

Every effort shall be made to eliminate foreign systems above equipment to the structural ceiling. If this is not possible, the Contractor shall encase any pipe in a second pipe with a minimum number of joints. Provide 18 gauge (minimum) galvanized, 4 inch (minimum) deep drain pans under piping and ductwork located or passing over electrical equipment. Pipe 1" drain from pan to nearest floor drain. Drain pan shall be adequately supported and constructed to hold 4 inches of water without collapse.

- J. Lubrication: The Contractor shall be held responsible for all damage to bearings while the equipment is being operated up to the date of acceptance of the equipment. The Contractor shall be required to protect all bearings during installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. Pump shafts, fan shafts, motor shafts, etc. shall be coated to prevent deterioration in moist or wet atmospheres.

### **3.05 CUTTING AND PATCHING**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Under each section of the specifications, the Contractor shall be responsible for all required cutting, etc., incident to his work under that section, and shall make all satisfactory repairs, but in no case shall the Contractor cut into any major structural element, beam or column.



SECTION 23 00 00  
SUPPLEMENTARY HVAC GENERAL CONDITIONS

2. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades because of fault, error or tardiness or because of any damage done by own workmanship.
  3. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Proceed with patching after construction operations requiring cutting are complete.
- D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize

- evidence of patching and refinishing.
- a. Clean piping and similar features before applying paint or other finishing materials.
  - b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- E. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### **3.06 PAINTING**

- A. The Contractor shall remove all rust, oil and grease from exposed surfaces and clean all apparatus or materials specified to be painted under this section of the specifications.
- Contractor shall paint equipment, piping, etc., in accordance with Division 9.
- Equipment specified to have factory finishes shall be protected until completion of the Contract, with Contractor being responsible for maintaining finishes.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
1. Interior, Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  2. Interior, Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
  3. Interior, Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  4. Do not paint piping specialties with factory-applied finish.

SECTION 23 00 00  
SUPPLEMENTARY HVAC GENERAL CONDITIONS

5. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
6. Galvanized surfaces damaged during installation shall be repaired with a galvanized repair compound complying with Mil Spec DOD-P-21035B. Any equipment scratched, marred or damaged will be repainted to the original condition.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.
- E. Electronically Commutated Motors (ECM).

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.
- B. Section 26 29 13 - Enclosed Controllers.

**1.03 REFERENCE STANDARDS**

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.
- C. NEMA MG 1 - Motors and Generators; 2018.
- D. 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 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Operation Data: Include instructions for safe operating procedures.

- D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

### **1.05 QUALITY ASSURANCE**

- A. Comply with NFPA 70.

### **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.

### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

## **PART 2 PRODUCTS**

### **2.01 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A. Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 104 degrees F environment.
  - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- B. 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.
- C. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

### **2.02 APPLICATIONS**

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.
- B. Single phase motors for shaft mounted fans: Split phase type.
- C. Motors located in exterior locations, air cooled condensers, and direct drive axial fans:  
Totally enclosed type.

**2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS**

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

**2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS**

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

**2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS**

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.

- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

## **2.06 THREE PHASE POWER - SQUIRREL CAGE MOTORS**

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for

wiring into motor starter; refer to Section 26 29 13.

- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- J. Sound Power Levels: To NEMA MG 1.
- K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- M. Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.
- N. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

## **2.07 ELECTRONICALLY COMMUTATED MOTORS (ECM)**

- A. Applications:
  - 1. Commercial:
    - a. Roof Top Unit:
      - 1) Operating Mode: Constant torque.
      - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
      - 3) Shaft Extension: Single.
      - 4) RPM: 300 through 1200.



**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.

**1.03 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- 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 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 PIPE SLEEVES**

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch 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.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.

### **2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS**

- A. Modular/Mechanical Seal:
1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  2. Provide watertight seal between pipe and wall/casing opening.
  3. Elastomer element size and material in accordance with manufacturer's recommendations.
  4. Glass reinforced plastic pressure end plates.

### **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 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. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
  - 4. 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.

### **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. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

- H. MFMA-4 - Metal Framing Standards Publication; 2004.
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- J. 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.
  - 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 30 00.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems and nonpenetrating rooftop supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with applicable building code.

- B. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

### **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. 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.
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. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
  - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
  - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

- B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

- C. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.



## HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

1. Comply with MFMA-4.
- D. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- E. Thermal Insulated Pipe Supports:
1. General Construction and 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 inch 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.
- F. Pipe Supports:
1. 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.
  2. 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.
- G. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.

## HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- H. Riser Clamps:
1. Provide copper plated clamps for copper tubing support.
  2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- I. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- J. Strut Clamps: Two-piece pipe clamp.
- K. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- L. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- M. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
1. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
- N. Pipe Alignment Guides: Galvanized steel.
1. Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
  2. Pipe Diameter 10 inches and Larger: Roller type.
- O. 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.
- P. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. 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.
  2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- Q. Pipe Shields for Insulated Piping:
1. 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.
- R. 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 clamps, machine bolts, or welded threaded studs.
  7. Sheet Metal: Use sheet metal screws.
  8. Wood: Use wood screws.
  9. Powder-actuated fasteners are not permitted.
  10. 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.
- S. Pipe Installation Accessories:
1. Copper Pipe Supports:

### **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.
- 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 3 inch high concrete pad constructed in accordance with Section 03 30 00.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Seismic control requirements.
- C. Vibration-isolated equipment support bases.
- D. Vibration isolators.
- E. Seismic restraint systems.
- F. Vibration-isolated and/or seismically engineered roof curbs.

### **1.02 RELATED REQUIREMENTS**

- A. Section 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Section 03 30 00 - Cast-in-Place Concrete.

### **1.03 DEFINITIONS**

- A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

### **1.04 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

- C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- H. MFMA-4 - Metal Framing Standards Publication; 2004.
- I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

#### **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. Seismic Controls:
    - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
    - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
  - 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 30 00.

#### **1.06 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. 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.
- D. Shop Drawings - Seismic Controls:
  - 1. Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
  - 2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  - 3. Indicate proposed arrangement of distributed system trapeze support groupings.
  - 4. Indicate proposed locations for distributed system flexible fittings and/or connections.
  - 5. Indicate locations of seismic separations where applicable.
- E. Seismic Design Data:
  - 1. Compile information on project-specific characteristics of actual installed HVAC components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
    - a. Component operating weight and center of gravity.
    - b. Component elevation in the building in relation to the roof elevation (z/h).
    - c. Component importance factor ( $I_p$ ).
    - d. For distributed systems, component materials and connection methods.
    - e. Component amplification factor ( $a_p$ ) and component response modification factor ( $R_p$ ), determined in accordance with ASCE 7 tables.
  - 2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.
- F. Certification for seismically qualified equipment; identify basis for certification.



- G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- H. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Evidence of qualifications for seismic controls designer.
- J. Evidence of qualifications for manufacturer.
- K. Manufacturer's detailed field testing and inspection procedures.
- L. 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.

#### **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 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.
  3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
  4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
  5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.
- D. 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. Suspended Piping, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
  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 SEISMIC CONTROL REQUIREMENTS**

- A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and

operating loads and other structural design considerations of the installed location.

Consider wind loads for outdoor HVAC components.

- B. Seismic Design Criteria: Obtain from project Structural Engineer of Record.
- C. Component Importance Factor ( $I_p$ ): HVAC components essential to life safety to be assigned a component importance factor ( $I_p$ ) of 1.5 as indicated or as required. This includes but is not limited to:
  - 1. HVAC components required to function for life safety purposes after an earthquake.
  - 2. HVAC components that support or otherwise contain hazardous substances.
- D. Seismic Restraints:
  - 1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
  - 2. Seismic Restraint Exemptions:
    - a. Exemptions for Seismic Design Category D, E, and F:
      - 1) Discrete HVAC components that are positively attached to the structure where either of the following apply:
        - (a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor ( $I_p$ ) is 1.0.
        - (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
      - 2) HVAC piping with component importance factor ( $I_p$ ) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor ( $I_p$ ) of 1.5 and nominal pipe size of 1 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).
    - b. Duct System Exemptions, All Seismic Design Categories:
      - 1) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control with component importance factor ( $I_p$ ) of 1.0, where flexible connections or other assemblies are provided

between duct system and associated components, where duct system is positively attached to the structure, and where one of the following apply:

- (a) Trapeze supported duct with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
  - (b) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
  - (c) Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
  - (d) Hanger supported duct with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.
- 2) Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control, where there are provisions to avoid impact with other ducts or mechanical components or to protect ducts in the event of such impact, and where duct system is positively attached to the structure and has a cross sectional area of less than 6 square feet and weighs 20 pounds per foot or less.
- c. HVAC Piping Exemptions, All Seismic Design Categories:
- 1) HVAC piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
    - (a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
    - (b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the

- total weight supported by any single trapeze is 100 pounds or less.
- (c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.
  - (d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor ( $I_p$ ) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.
  - (e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor ( $I_p$ ) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 412.
    - c. FEMA 413.
    - d. FEMA 414.
    - e. FEMA E-74.
    - f. SMACNA (SRM).
  4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
  5. Seismic Type Vibration Isolators:
    - a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
  6. Seismic Restraint Systems:

- a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
  - b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
  - c. Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
  - d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
  - e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
  - f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
  - g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
  - h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
  - i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
7. Ductwork Applications:
- a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
  - b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.
- E. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
  2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
  3. Do not use power-actuated fasteners.

4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
  5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  6. Concrete Housekeeping Pads:
    - a. Increase size of pad as required to comply with anchor requirements.
    - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.
- F. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
  2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
    - a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
    - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
    - c. Design displacements at seismic separations.
    - d. Anticipated drifts between floors.

### **2.03 VIBRATION ISOLATORS**

- A. 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.
  3. Seismic Snubbing Elements for Seismic Isolators:

- a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
  - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.
- B. 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. 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.
  3. Housed Spring Isolators:
    - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
    - 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.
  4. 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.
  5. Resilient Material Isolator Hangers, Nonseismic:



## VIBRATION AND SEISMIC CONTROLS FOR HVAC

- 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.
  6. 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.
  7. 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.
- C. Vibration Isolators for Seismic Applications:
1. Resilient Material Isolator Mounts, Seismic:
    - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
  2. Restrained Spring Isolators, Seismic:
    - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
    - b. Bottom Load Plate: Steel 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.
  3. Resilient Material Isolator Hangers, Seismic:
    - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated

for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.

4. Spring Isolator Hangers, Seismic:
  - 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; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
  - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

#### **2.04 ACOUSTICAL AND VIBRATION ISOLATORS**

##### **A. General Requirements:**

1. Acoustical Isolation System: Through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.

#### **2.05 SEISMIC RESTRAINT SYSTEMS**

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

##### **B. Cable Restraints:**

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

#### **2.06 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS**

##### **A. Vibration Isolation Curbs:**

1. Nonseismic Curb Rail:
  - a. Location: Between existing roof curb and rooftop equipment.
  - b. Construction: Aluminum.
  - c. Integral vibration isolation to comply with requirements of this section.
  - d. Weather exposed components consist of corrosion resistant materials.
2. Nonseismic Curb:

- a. Location: Between structure and rooftop equipment.
  - b. Construction: Aluminum.
  - c. Integral vibration isolation to comply with requirements of this section.
  - d. Weather exposed components consist of corrosion resistant materials.
3. Seismic Curb:
- a. Location: Between structure and rooftop equipment.
  - b. Construction: Steel.
  - c. Integral vibration isolation to comply with requirements of this section.
  - d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
  - e. Weather exposed components consist of corrosion resistant materials.
- B. Seismic Type Nonisolated Curb and Fabricated Equipment Piers:
1. Location: Between structure and rooftop equipment.
  2. Construction: Steel.
  3. Weather exposed components consist of corrosion resistant materials.

### **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 CODE-REQUIRED SPECIAL INSPECTIONS**

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  1. Continuous Special Inspections: Special Inspection Agency 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 Inspections: Special Inspection Agency 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.
- C. Seismic special inspections include, but are not limited to:
1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
  2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
  3. Installation and anchorage of ductwork designed to carry hazardous materials for Seismic Design Categories C, D, E and F; periodic inspection.
  4. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
  5. Verification of required clearances between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.
- D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

### **3.03 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. Spring Isolators:
  - a. Position equipment at operating height; provide temporary blocking as required.
  - 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.
2. 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.
3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
5. Adjust isolators to be free of isolation short circuits during normal operation.
6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
  - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
  - a. Size in accordance with seismic design to meet anchor requirements.

- b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
- 6. Seismic Restraint Systems:
  - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
  - b. Install restraints within permissible angles in accordance with seismic design.
  - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
  - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
  - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - 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. Seismic Controls:
  - 1. Verify snubbing element air gaps.
- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

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## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Pipe markers.
- E. Ceiling tacks.

### **1.02 RELATED REQUIREMENTS**

- A. Section 09 91 23 - Interior Painting: Identification painting.

### **1.03 REFERENCE STANDARDS**

- A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

## **PART 2 PRODUCTS**

### **2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Dampers: Ceiling tacks, where located above lay-in ceiling.



- C. Ductwork: Nameplates.
- D. Piping: Tags.
- E. Small-sized Equipment: Tags.
- F. Thermostats: Nameplates.
- G. Valves: Tags and ceiling tacks where located above lay-in ceiling.

## **2.02 NAMEPLATES**

- A. Letter Color: White.
- B. Letter Height: 1/4 inch.
- C. Background Color: Black.
- D. Plastic: Comply with ASTM D709.

## **2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

## **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.
- C. Color: Yellow/Black.

## **2.05 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
- B. Stencil Paint: As specified in Section 09 91 23, semi-gloss enamel, colors complying with ASME A13.1.

## **2.06 PIPE MARKERS**

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Color code as follows:
  1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

## **2.07 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.

## **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 91 23 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 91 23.

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IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- 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. Install ductwork with plastic nameplates. 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.
- H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of refrigerating systems.

### **1.02 RELATED REQUIREMENTS**

- A. Section 01 40 00 - Quality Requirements: Employment of testing agency and payment for services.

### **1.03 REFERENCE STANDARDS**

- A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008 (Reaffirmed 2017).
- B. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - 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. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Architect.
  - 2. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
  - 3. Include at least the following in the plan:
    - a. Preface: An explanation of the intended use of the control system.
    - b. List of all air flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be

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gathered for each.

- d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
- e. Final test report forms to be used.
- f. Detailed step-by-step procedures for TAB work for each system and issue, including:
  - 1) Terminal flow calibration (for each terminal type).
  - 2) Diffuser proportioning.
  - 3) Branch/submain proportioning.
  - 4) Total flow calculations.
  - 5) Rechecking.
  - 6) Diversity issues.
- g. Expected problems and solutions, etc.
- h. Specific procedures that will ensure that air side are operating at the lowest possible pressures and methods to verify this.
- i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
- j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
- k. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
- l. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Quality-control Testing of Laboratory Fume Hoods:

1. Product Data sheets for all equipment proposed for use in on-site as-installed testing.
2. Sample Test Report.
3. List of laboratory fume hoods to be tested. Submit a minimum of one week prior to commencement of testing.
4. Test data demonstrating that each type of fume hood provided for the project has been successfully tested in the factory as per requirements of Section 11 53 13.

E. Control System Coordination Reports: Communicate in writing to the controls installer

all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

- F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project.  
Provide final copies for Architect and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
6. Include the following on the title page of each report:
  - a. Name of Testing, Adjusting, and Balancing Agency.
  - b. Address of Testing, Adjusting, and Balancing Agency.
  - c. Telephone number of Testing, Adjusting, and Balancing Agency.
  - d. Project name.
  - e. Project location.
  - f. Project Architect.
  - g. Project Engineer.
  - h. Project Contractor.
  - i. Project altitude.
  - j. Report date.

**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. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of three years documented experience.
3. Certified by one of the following:
  - a. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
  - b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
  11. Duct system leakage is minimized.
  12. Pumps are rotating correctly.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### **3.03 PREPARATION**

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
  1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

### **3.04 ADJUSTMENT TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### **3.05 RECORDING AND ADJUSTING**

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### **3.06 FUME HOOD TESTING (ON SITE)**

- A. General: Test fume hoods as installed to assess airflow velocity, airflow visualization, and level of containment. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for 100% of the hoods provided in the Project.
- B. Preparation: Visit the project site to confirm that construction activities related to the fume hood system(s) and equipment are complete. Review design documents and



Contractor's submittals. Verify that mechanical ventilation systems serving the space are functioning and operating in the normal mode. Notify Owner in writing, if conditions exist which preclude proper fume hood testing. Starting of testing constitutes acceptance of site conditions.

C. Testing Requirements:

1. Perform the following tests, in order:
  - a. Airflow Velocity Test.
  - b. Airflow Visualization Test.
  - c. Tracer Gas Containment Test.
2. Airflow Velocity Test: Comply with Section 9 of NEBB (FHT) Fume Hood Testing Standard - current edition.
3. Airflow Visualization Test: Comply with Section 10 of NEBB (FHT) Fume Hood Testing Standard - current edition.
4. Tracer Gas Containment Test:
  - a. Comply with Section 11 of NEBB Fume Hood Testing Standard - current edition.

**3.07 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.
- 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.

### **3.08 SCOPE**

- A. Test, adjust, and balance the following:
  - 1. Air Cooled Refrigerant Condensers.
  - 2. Packaged Roof Top Heating/Cooling Units.
  - 3. Unit Air Conditioners.
  - 4. Air Handling Units.
  - 5. Fans.
  - 6. Air Inlets and Outlets.

### **3.09 MINIMUM DATA TO BE REPORTED**

- A. Air Cooled Condensers:
  - 1. Identification/number.
  - 2. Location.
  - 3. Manufacturer.
  - 4. Model number.
  - 5. Serial number.
  - 6. Entering DB air temperature, design and actual.
  - 7. Leaving DB air temperature, design and actual.
  - 8. Number of compressors.

B. Return Air/Outside Air:

1. Design air flow.
2. Actual air flow.

C. Exhaust Fans:

1. Manufacturer.
2. Model number.
3. Air flow, specified and actual.
4. Fan RPM.

D. Air Monitoring Stations:

1. Identification/location.
2. System.
3. Size.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.

E. Sound Level Reports:

1. Location.
2. Octave bands - equipment off.
3. Octave bands - equipment on.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

- I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005  
(Revised 2009).
- 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 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

### **1.04 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.

### **1.05 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.

### **1.06 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 PRODUCTS**

## 2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

## 2.02 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- B. 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.
- C. Vapor Barrier Tape:
- D. Indoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Outdoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

## 2.03 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 lb/cu ft.
- B. 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.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

**2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

A. 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.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

C. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

**2.05 JACKETS**

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

1. Lagging Adhesive:
  - a. Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M).

1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Ducts Conveying Air Below Ambient Temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated Ducts Conveying Air Above Ambient Temperature:
  - 1. Provide with or without standard vapor barrier jacket.
  - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- F. External Duct Insulation Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Secure insulation without vapor barrier with staples, tape, or wires.
  - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct and Plenum Liner Application:
  - 1. Adhere insulation with adhesive for 90 percent coverage.



2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air-flow.  
Increase duct size to allow for insulation thickness.

### **3.03 SCHEDULES**

- A. All supply, return, outside air, and exhaust air to energy recovery units ductwork shall be insulated with 2" thick glass fiber duct wrap.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.
- D. Engineered wall outlet seals and refrigerant piping insulation protection.

**1.02 RELATED REQUIREMENTS**

- A. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

**1.03 REFERENCE STANDARDS**

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- F. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016, with Editorial Revision (2021).
- G. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

- H. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2008 (Reapproved 2019).
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- M. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- O. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented 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 or UL 723.

### **2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  1. Minimum Service Temperature: Minus 40 degrees F.
  2. Maximum Service Temperature: 180 degrees F.
  3. Connection: Waterproof vapor barrier adhesive.

### **2.03 JACKETS**

- 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.

- c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
  - d. Thickness: 10 mil.
  - e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
- 1. Thickness: 0.016 inch sheet.
  - 2. Finish: Smooth.
  - 3. Joining: Longitudinal slip joints and 2 inch laps.
  - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

## **2.04 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING**

### **INSULATION PROTECTION**

- A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
- 1. Wall Outlet Size, Siding and Compact Applications: 6-7/8 inch wide by 3-7/8 inch high.
    - a. Elastomeric Sleeve Diameter: 1-11/16 inch.
  - 2. Outlet Cover Color: Gray.
  - 3. Water Penetration: Comply with ASTM E331.
  - 4. Air Leakage: Comply with ASTM E283.
  - 5. Air Permeance: Comply with ASTM E2178.
- B. Insulation Protection System: Refrigerant piping insulation PVC protective cover.
- 1. PVC Insulation Cover Color: Black with full-length velcro fastener.
  - 2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
  - 3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
  - 4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
  - 5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.
  - 6. Carbon Arc Light Exposure: Comply with ASTM G153.
  - 7. Tensile Strength After UV Exposure and Water Immersion: Comply with ASTM D412.
  - 8. Water Absorption of Plastics: Comply with ASTM D570.

## **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. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
  1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- 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.
- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.  
  
Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

- G. 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: 1"
2. Refrigerant Suction: 1"
3. Refrigerant Hot Gas: 1"

## **PART 1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- A. Section 23 09 93 - Sequence of Operations for HVAC Controls.
- B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

### **1.02 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.
- 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.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - 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.
  - 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.

#### **1.04 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.

#### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Provide five year manufacturer's warranty for field programmable micro-processor based units.

## **PART 2 PRODUCTS**

### **2.01 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. 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.
- E. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

### **2.02 OPERATOR INTERFACE**

- A. PC Based Work Station:
  - 1. Resides on high speed network with building controllers.
  - 2. Connected to server for full access to all system information.
- B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.
- C. BACnet protocol to comply with ASHRAE Std 135.
- D. Hardware:

1. Desktop:
  - a. Computer(s) and display(s) to be provided by DDC controls manufacturer.
  - b. Quantity: As indicated on the drawings.
  - c. Minimum RAM: \_\_\_\_\_.
  - d. Minimum Processing Speed: \_\_\_\_\_.
  - e. Minimum Hard Drive Memory: \_\_\_\_\_.
  - f. Drives: \_\_\_\_\_.
  - g. Ports: \_\_\_\_\_.
  - h. Monitor: \_\_\_\_\_.
  - i. Location(s): As indicated on the drawings.
  - j. Network Connection:
    - 1) Ethernet interface card.
    - 2) Minimum Speed: \_\_\_\_\_.
  - k. System Printer:
    - 1) Printer(s) to be provided by DDC controls manufacturer.
    - 2) Quantity: As indicated on the drawings.
    - 3) Type: \_\_\_\_\_.
    - 4) Resolution: \_\_\_\_\_.
    - 5) Minimum Print Speed: \_\_\_\_\_.
    - 6) Locations(s): As indicated on the drawings.
2. Laptop:
  - a. Laptop(s) to be provided by DDC controls manufacturer.
  - b. Quantity: As indicated on the drawings.
  - c. Network Connection:
    - 1) Ethernet interface card.

## 2.03 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.
  - 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. External Input-Output (I-O) Data Bus:
- 4. 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.
- 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.
    - 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. 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.
- 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
- 6. 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. 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.
  - 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
  - 6. 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.
    - 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:
  - 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.

## **2.04 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.
- 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.

## 2.05 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.
    - b. Ancillary Equipment:
      - 1) Fans.
- B. Workstation System Applications:
  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.
  - 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:
    - 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.

## 2.06 CONTROLLER SOFTWARE

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.
- 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.
- F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.
- G. Sequencing: Application software based upon specified sequences of operation in Section 23 09 93.
- H. 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.
- I. Staggered Start Application:
  - 1. Prevents all controlled equipment from simultaneously restarting after power outage.
  - 2. Order of equipment startup is user selectable.
- J. 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.
- K. Anti-Short Cycling:
  - 1. All binary output objects protected from short-cycling.

2. Allows minimum on-time and off-time to be selected.
- L. 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.
- M. Run-Time Totalization:
  1. Totalize run-times for all binary input objects.
  2. Provides operator with capability to assign high run-time alarm.

### **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 09 93.
- C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.
- D. Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

**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.

**3.04 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstrate complete and operating system to Owner.

**3.05 MAINTENANCE**

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- C. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- D. Provide complete service of systems, including call backs. Make minimum of \_\_\_\_ complete normal inspections of approximately \_\_\_\_ hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.



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## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

### **1.02 RELATED REQUIREMENTS**

- A. Section 09 91 13 - Exterior Painting.
- B. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.
- C. Section 31 23 16 - Excavation.
- D. Section 31 23 23 - Fill.
- E. Section 33 52 16 - Gas Hydrocarbon Piping.

### **1.03 REFERENCE STANDARDS**

- A. ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators; 2019.
- B. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators; 2011 (Addendum A, 2012).
- C. ANSI Z223.1 - National Fuel Gas Code; 2024.
- D. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- F. ASME B31.1 - Power Piping; 2022.
- G. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- K. AWWA C606 - Grooved and Shouldered Joints; 2015.
- L. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.  
Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.

#### **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.

### **PART 2 PRODUCTS**

#### **2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: ANSI Z223.1, welded.
  - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

#### **2.02 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.

### **2.03 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 Inches and Under:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- B. Flanges for Pipe Size Over 1 Inch:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  - 1. Dimensions and Testing: In accordance with AWWA C606.
  - 2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
  - 3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
  - 4. Gasket Material: Nitrile rubber suitable for operating temperature range from minus 20 degrees F to 180 degrees F.
  - 5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  - 6. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

### **2.04 BALL VALVES**

- A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

## **2.05 PLUG VALVES**

- A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

## **2.06 STRAINERS**

- A. Size 2 inch and Under:
  - 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  - 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 1-1/2 inch to 4 inch:
  - 1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

## **2.07 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS**

### **INDICATORS**

- A. Compliance Requirements:
  - 1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
  - 2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
- B. Materials in Contact With Gas:
  - 1. Housing: Aluminum, steel (free of non-ferrous metals).
  - 2. Seals and Diaphragms: NBR-based rubber.
- C. Maximum Inlet Operating Pressure: 10 psi.
  - 1. Appliance Regulator: 10 psi.
  - 2. Line Pressure Regulator: 10 psi.
- D. Maximum Body Pressure: 10 psi.
- E. Output Pressure Range: 1 inch wc to 80 inch wc.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

1. Painting of exterior piping systems and components is specified in Section 09 91 13.
- L. Excavate in accordance with Section 31 23 16.
- M. Backfill in accordance with Section 31 23 23.
- N. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- O. Sleeve pipes passing through partitions, walls and floors.
- P. 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.

### **3.04 APPLICATION**

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball valves for throttling, bypass, or manual flow control services.
- D. Provide plug valves in natural gas systems for shut-off service.

### **3.05 SERVICE CONNECTIONS**

- A. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure regulators.
- H. Pressure relief valves.
- I. Filter-driers.
- J. Solenoid valves.
- K. Expansion valves.
- L. Receivers.
- M. Flexible connections.
- N. Engineered wall seals and insulation protection.
- O. Exterior penetration accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 31 00 - Access Doors and Panels.
- B. Section 23 07 19 - HVAC Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
- B. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.



- C. AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2019, with All Amendments and Errata.
- E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2019.
- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- G. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2020.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- N. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- P. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- Q. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- R. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- S. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
- T. ICC (IMC)-2018 - International Mechanical Code; 2018.
- U. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D. Test Reports: Indicate results of leak test, acid test.
- E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

- F. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- G. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

### **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 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.
  - 3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.
- B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
  - 1. Fittings: ASME B16.26 cast copper.
  - 2. Joints: Flared.

### **2.02 MOISTURE AND LIQUID INDICATORS**

- A. Indicators: Single 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.

## 2.03 VALVES

### A. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

### B. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

### C. 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.

### D. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

## 2.04 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.

### B. Straight Line, Non-Cleanable Type:

1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of \_\_\_\_\_ psi.

## 2.05 CHECK VALVES

### A. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.
- B. Straight Through Type:
1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

## **2.06 PRESSURE REGULATORS**

- A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

## **2.07 PRESSURE RELIEF VALVES**

- A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

## **2.08 FILTER-DRIERS**

- A. Performance:
1. Flow Capacity - Liquid Line: \_\_\_\_\_ ton, minimum, rated in accordance with AHRI 710.
  2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
  3. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
1. Connections: As specified for applicable pipe type.

## **2.09 EXPANSION VALVES**

- A. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.
- B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

## **2.10 RECEIVERS**

- A. Internal Diameter Over 6 inch:
  - 1. AHRI 495, welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; 400 psi with tappings for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

## **2.11 FLEXIBLE CONNECTORS**

- A. 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.

## **2.12 ENGINEERED WALL SEALS AND INSULATION PROTECTION**

- A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
  - 1. Outlet Cover Color: Gray.
  - 2. Water Penetration: Comply with ASTM E331.
  - 3. Air Leakage: Comply with ASTM E283.
  - 4. Air Permeance: Comply with ASTM E2178.
- B. Insulation Protection System: Mechanical line insulation and PVC cover.
  - 1. PVC Insulation Cover Color: Black with full-length velcro fastener.
  - 2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.

3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.
6. Adhesive free.

## **2.13 EXTERIOR PENETRATION ACCESSORIES**

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **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. 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.
- G. 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. Place hangers within 12 inches of each horizontal elbow.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Provide copper plated hangers and supports for copper piping.
- H. 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.
- I. Provide clearance for installation of insulation and access to valves and fittings.
- J. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 31 00.
- K. Flood piping system with nitrogen when brazing.
- L. Insulate piping and equipment; refer to Section and Section 23 07 16.
- M. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- N. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- O. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.



P. Fully charge completed system with refrigerant after testing.

**3.03 FIELD QUALITY CONTROL**

A. See Section 01 40 00 - 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 to no leakage.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Kitchen hood ductwork.
- D. Dust collection ductwork.
- E. Duct cleaning.

### **1.02 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- H. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

- I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.
- J. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.
- K. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Manufacturer's Certificate: Certify that installation of ductwork meet or exceed specified requirements.
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).
- E. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### **1.04 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.

### **1.05 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## **PART 2 PRODUCTS**

### **2.01 DUCT ASSEMBLIES**

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel, seal class B
- D. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel, Seal Class B
- E. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel, Seal Class B
- F. Kitchen Cooking Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
  - 1. Construct of 16 gage, 0.0598 inch sheet steel using continuous external welded joints in rectangular sections.
- G. Dishwasher Exhaust: 1/2 inch w.g. pressure class, aluminum.
- H. Fume Hood Exhaust: 1/2 inch w.g. pressure class, coated galvanized steel..
- I. Dust Collection Exhaust: Galvanized ASTM A527 with a G90 rating with the smooth interior clamp connection system equal to Norfab Quick Fit Piping System.

### **2.02 MATERIALS**

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14.  
Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. PVC Coating for Steel Ducts: 4 mils polyvinyl chloride plastic on both sides.
- D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. 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.
  2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  3. For Use With Flexible Ducts: UL labeled.
- E. Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.
- F. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

### **2.03 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### **2.04 MANUFACTURED DUCTWORK AND FITTINGS**

- A. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- B. Round Ducts: Round lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- C. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
  - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
  - 3. Maximum Velocity: 4000 fpm.
  - 4. Temperature Range: Minus 20 degrees F to 210 degrees F.
- D. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
- E. Specialty Coatings for Metal Ductwork: Factory or field-applied per manufacturers instructions.
  - 1. Application: \_\_\_\_\_.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- I. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

### **3.02 CLEANING**

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Backdraft dampers - metal.
- B. Flexible duct connectors.
- C. Volume control dampers.

### **1.02 RELATED REQUIREMENTS**

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- B. Section 23 31 00 - HVAC Ducts and Casings.
- C. Section 25 35 23 - Integrated Automation Control Dampers: Product furnishing.

### **1.03 REFERENCE STANDARDS**

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.



- C. Project Record Drawings: Record actual locations of access doors and test holes.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fusible Links: One of each type and size.

### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **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. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

### **2.02 DUCT ACCESS DOORS**

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.

### **2.03 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

### **2.04 FLEXIBLE DUCT CONNECTORS**

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.

### **2.05 VOLUME CONTROL DAMPERS**

- A. Products furnished per Section 25 35 23.

- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Splitter Dampers:
  - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages 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 gage, 0.0239 inch, minimum.
- E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- 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.
- G. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

### **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). Refer to Section 23 31 00 for duct construction and pressure class.

- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- E. Use splitter dampers only where indicated.
- F. 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.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Forward curved centrifugal fans.
- B. Accessories.

### **1.02 REFERENCE STANDARDS**

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

#### **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.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

#### **1.06 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Comply with AMCA 99.

#### **2.02 ACCESSORIES**

- A. Discharge Dampers: Parallel blade heavy duty steel damper assembly with blades constructed of two plates formed around and welded to shaft, channel frame, sealed ball bearings, with blades linked out of air stream to single control lever.
- B. Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Roof exhausters.
- B. Roof ventilators.
- C. Upblast roof exhausters.
- D. Kitchen hood upblast roof exhausters.
- E. Laboratory and fume exhaust.

### **1.02 REFERENCE STANDARDS**

- A. AMCA 99 - Standards Handbook; 2016.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- C. AMCA 211 - Certified Ratings Program Product Rating Manual for Fan Air Performance; 13th Edition, Revised 2017.
- D. AMCA 260 - Laboratory Methods of Testing Induced Flow Fans for Rating; 2013.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. AMCA 311 - Certified Ratings Program Product Rating Manual for Fan Sound Performance; 2016.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.
- I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

#### **1.04 QUALITY ASSURANCE**

### **PART 2 PRODUCTS**

#### **2.01 POWER VENTILATORS - GENERAL**

- A. Fabrication: Comply with AMCA 99.
- B. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

#### **2.02 ROOF EXHAUSTERS**

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

#### **2.03 UPBLAST ROOF EXHAUSTERS**

- A. Direct Drive Fan:

1. Fan Wheel:
    - a. Type: Non-overloading, backward inclined centrifugal.
  2. Housing:
    - a. Rigid internal support structure.
    - b. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
    - c. Provide breather tube for fresh air motor cooling and wiring.
- B. Shafts and Bearings:
1. Fan Shaft:
    - a. Ground and polished steel with anti-corrosive coating.
    - b. First critical speed at least 25 percent over maximum cataloged operating speed.
  2. Bearings:
    - a. Permanently sealed or pillow block type.
    - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
    - c. 100 percent factory tested.
- C. Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
  2. Belts: Static free and oil resistant.
  3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
  4. Motor pulley adjustable for final system balancing.
  5. Readily accessible for maintenance.
- D. Disconnect Switches:
1. Factory mounted and wired.
  2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  3. Finish for Painted Steel Enclosures: Provide manufacturer's standard, factory applied gray, or \_\_\_\_\_ unless otherwise indicated.
  4. Positive electrical shutoff.
  5. Wired from fan motor to junction box installed within motor compartment.
- E. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, and factory installed nailer strip.



- F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

#### **2.04 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS**

A. Belt Drive Fan:

1. Fan Wheel:
  - a. Type: Non-overloading, backward inclined centrifugal.
2. Housing:
  - a. Rigid internal support structure.
  - b. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
  - c. Provide breather tube for fresh air motor cooling and wiring.

B. Shafts and Bearings:

1. Fan Shaft:
  - a. Ground and polished steel with anti-corrosive coating.
  - b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
  - a. Permanently sealed or pillow block type.
  - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
  - c. 100 percent factory tested.

C. Drive Assembly:

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

D. Disconnect Switches:

1. Factory mounted and wired.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish for Painted Steel Enclosures: Provide manufacturer's standard, factory applied gray, or \_\_\_\_\_ unless otherwise indicated.
4. Positive electrical shutoff.
5. Wired from fan motor to junction box installed within motor compartment.

- E. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, factory installed nailer strip, and \_\_\_\_\_.
- F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

## **2.05 LABORATORY AND FUME EXHAUST**

### **A. General Requirements:**

- 1. Provide fan types tested in accordance with AMCA 210, AMCA 260 (Induced Flow Fans) and AMCA 300 in an AMCA-accredited laboratory.
- 2. Provide fan units rated in accordance with AMCA 211 and AMCA 311.

### **B. Fan Assemblies:**

- 1. Provide unit suitable for maintaining structural integrity and operation in 125 mph wind without external guy-wires or supplemental supports when mounted on manufacturer-supplied roof curbs.

### **C. Belt Drive Fan:**

- 1. Fan Wheel:
  - a. Type: Non-overloading, backward inclined centrifugal.
- 2. Housing:
  - a. Rigid internal support structure.
  - b. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
  - c. Provide breather tube for fresh air motor cooling and wiring.

### **D. Disconnect Switches:**

- 1. Factory mounted and wired.
  - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 3. Finish for Painted Steel Enclosures: Provide manufacturer's standard, factory applied gray, or \_\_\_\_\_ unless otherwise indicated.
  - 4. Positive electrical shutoff.
  - 5. Wired from fan motor to junction box installed within motor compartment.
- E. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, and factory

installed nailer strip.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof and wall exhausters.
- F. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. S-1000 Enclosureless Dust Collector
- B. Related Accessories
- C. Compliances
  - 1. NFPA 664-2012 for Enclosureless Dust Collector less than 5000CFM for wood dust.

**1.02 SUBMITTALS**

- A. See Division 0101 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate dimensions, sizes, weights and point loadings, material thickness, and locations and sizes of field connections. Submit construction layout and details for inlet fittings.
- C. Product Data: Provide manufacturers literature and data indicating rated capacities, dimensions, weights and point loadings, accessories, electrical characteristics and connection requirements, wiring diagrams, and location and sizes of field connections.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit sound power levels for both fan inlet and outlet at rated capacity.
- F. Manufacturer's Installation Instructions: Indicate assembly and installation instructions.
- G. Operation and Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Filter Separator Filters: One.
  - 2. Extra Filter Bags: One.

**1.03 QUALITY ASSURANCE**

- A. Engage an experienced installer to perform work of this Section who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.
- B. All components shall be fabricated in strict accordance with standards set forth in the current edition of ISO 9001 and ISO 14001.
- C. Engage a firm experienced in manufacturing Filtration Systems similar to that indicated for this Project and with a record of successful in-service performance.

#### **1.04 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling and Unloading: Store in original protective crating and covering and in a dry location.

#### **1.05 COORDINATION**

- A. Coordinate layout and installation with other work, including light fixtures, fixed equipment and workstations, HVAC equipment, fire-suppression system components and equipment of movement such as overhead cranes.
- B. Coordinate location and requirements of service-utility connections.
- C. Coordinate location and requirements of each piece of equipment served.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

##### **A. HOUSING**

- 1. The S-Series shall be a high efficiency filtration unit. The filter housing shall be constructed out of minimum 18 gauge galvanized steel panels.

##### **B. FILTERS**

- 1. The S-Series Dust Collector shall contain filter bags in an open enclosure. The filters shall be vertical 8.66 inch diameter filters, 15 sq. ft. per bag. The S-1000 shall contain 24 bags

- a. Material: 100% woven polyester with integrated carbon fiber for improved anti-static properties
  - b. Construction: Vertically seamless
  - c. Maximum Operating Temperature: 289 °F
  - d. Material Basis Weight 16 Oz. per Sq. Ft.
  - e. Electrostatic Behavior:
    - 1) Surface Resistance:  $2.6 \times 10^7$  Ohm – DIN 54 345 TEIL 1
    - 2) Charging Toward PA: .7 kV TEFO Method 40-77
  - f. BIA Filter Efficiency: G
2. The maximum standard static pressure drop across the unit shall be 2" w. g.
  3. Filter exchange shall be performed on the clean side of the filters.

**C. DUST CONTAINER**

1. The dust collector shall have three, heavy duty 8 mil plastic bags. Each bag shall have a minimum capacity of 45 gallons. The collection bags shall connect to the dust collector by means of Quickfit clamp and will not require a tool for assembly or disassembly. Access to the bags shall be from either side of the dust collector.

**D. INTEGRAL FAN**

1. The unit shall have a unit mounted fan with a TEFC electrical motor.
  - a. Construction: Cold Rolled Steel and with powder coated finish
  - b. Rated Motor: 10HP
  - c. Nominal RPM: 1800
  - d. Rated Power: 208-230/460//60HZ//3ph
  - e. Rated RPM:1760
  - f. Enclosure: TEFC
  - g. NEMA Design: A
  - h. Continuous Duty
  - i. Inverter Duty Rated
  - j. FRAME: 184TC
  - k. Insulation Class F
  - l. Ambient Temperature 40 °C
  - m. KVA Code L
  - n. Service Factor: 1.25
  - o. UR (recognized)

**E. STARTERS**

1. Direct Online Starters-DOL
  - a. UL 508A listed
  - b. UL Type 12 Enclosure
  - c. Coil Voltage: Line

- d. Start/Stop Button
- e. 3 Phase and 1 Phase options
- F. Manufacturers:
  - 1. Nederman LLC or Approved Equal

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Provide surface/substrate preparation as required by the manufacturer's printed installation instructions. Do not proceed with installation until site is in proper condition to receive the S-Series Dust Collector.

#### **3.03 INSTALLATION**

- A. Install equipment in accordance with manufacturer's instructions.

#### **3.04 ADJUSTING**

- A.

#### **3.05 CLEANING**

- A. Remove all debris caused by installation. Clean all exposed surfaces to as fabricated condition and appearance.

#### **3.06 PROTECTION**

- A. Provide protection of the completed installation until completion of the project. Repair any damage at no additional cost to Owner.

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## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Diffusers:
- B. Registers/grilles:
  - 1. Ceiling-mounted, supply register/grilles.
- C. Duct-mounted supply and return registers/louvers.
- D. Fabric air distribution devices.

### **1.02 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- B. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.
- C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - 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.

- C. Samples: Submit two of each required air outlet and inlet type.
- D. Project Record Documents: Record actual locations of air outlets and inlets.

## **PART 2 PRODUCTS**

### **2.01 CEILING SUPPLY, EXHAUST, AND RETURN REGISTERS/GRILLES**

- A. Refer to Air Device schedule on drawings for performance and construction requirements.

### **2.02 FABRIC AIR DISTRIBUTION DEVICES**

- A. General Requirements:
  - 1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.
  - 2. Fabric air distribution devices must be designed in software which documents, calculates and provides pressure loss, inlet velocity, turbulent condition warnings, throw capability, entrainment, deflection, flow models, sizing, installation methods, sound generated and temperature corrections.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Energy recovery units.
- B. Casing.
- C. Fans.
- D. Total energy wheel.
- E. Filters.
- F. Roof curbs.
- G. Power and controls.
- H. Service accessories.

**1.02 REFERENCE STANDARDS**

- A. AHRI 1060 (I-P) - Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment; 2023.
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum a.
- C. ASHRAE Std 84 - Method of Testing Air-to-Air Heat/Energy Exchangers; 2024.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.
- C. Shop Drawings: Show design and assembly of energy recovery unit and installation and connection details.
- D. Manufacturer's Qualification Statement.
- E. Closeout Submittals: Submit manufacturer's operation and maintenance instructions.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements for additional provisions.
  - 2. Spare Parts: One of each kind of filter.

### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Firm regularly engaged in manufacturing energy recovery units.
  - 2. Products in satisfactory use in similar service for not less than five years.
  - 3. Manufactured and assembled in the United States of America.

### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1-1/2 years from date of Substantial Completion.
- C. Warranty energy recovery wheel to be free from defects in material and workmanship for 3 years under circumstances of normal use.

- D. Warranty motor to be free from defects in material and workmanship for 7 years under circumstances of normal use.

## **PART 2 PRODUCTS**

### **2.01 ENERGY RECOVERY UNITS**

- A. Energy Recovery Units: Provide dessicant wheel type air-to-air exchanger; prefabricated packaged system designed by manufacturer.
  - 1. Provide unit with a AHRI 1060 (I-P) compliant air-to-air exchanger.
  - 2. Permanent name plate listing manufacturer, model number, and serial number mounted inside door near electrical panel.

### **2.02 TOTAL ENERGY WHEEL**

- A. Wheel: Transfer heat and humidity from one air stream to the other with minimum carryover of the exhaust air into the supply air stream.
- B. Energy Wheel Media: Cleanable with low temperature steam, hot water or light detergent, without degrading the latent recovery.
- C. Wheel Effectiveness: Rated in accordance with ASHRAE Std 84 and AHRI 1060 (I-P).
- D. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
- E. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
- F. Energy Recovery Wheel Media Face:
  - 1. Comply with NFPA 90A.
- G. Rotor:
  - 1. Type: Non-segmented hygroscopic aluminum wheel.
  - 2. Rotor Matrix: Corrosion resistant aluminum alloy composed of alternating corrugated and flat, continuously wound layers of uniform widths.
- H. Drive:

1. Drive: Tensioned drive with full perimeter link style belt.

### **2.03 FILTERS**

- A. Efficiency: \_\_\_\_ MERV.
- B. Exhaust and Fresh Air Streams: MERV 11 filters constructed to meet ASHRAE Std 52.2.

### **2.04 ROOF CURBS**

- A. Curbs: Provide full perimeter roof curb fabricated from 10 gauge, 0.1345 inch aluminized steel.

1. Provide flat for roof deck.

### **2.05 POWER AND CONTROLS**

- A. Motor Control Panels: UL listed.
- B. Include necessary motor starters, fuses, transformers and overload protection according to NFPA 70.
- C. Provide single-point field connection to power supply.
- D. Install wiring in accordance with NFPA 70.

### **2.06 SERVICE ACCESSORIES**

- A. Electrical Receptacle:
  1. Provide duplex, ground fault interrupter type receptacle.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that structure is ready for installation of unit, that openings in deck for ductwork, if required, are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

### **3.02 INSTALLATION**

- A. Provide openings for suitable ductwork connection.

**3.03 SYSTEM STARTUP**

- A. Provide services of manufacturer's authorized representative to provide start up of unit.

**3.04 CLEANING**

- A. Clean filters, air plenums, interior and exposed-to-view surfaces prior to Substantial Completion.



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**PART 1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.02 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

**1.03 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.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.

#### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

### **PART 2 PRODUCTS**

#### **2.01 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS**

- A. General: Roof mounted units having gas burner and electric refrigeration that are 6 tons and smaller in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Disconnect Switch: Factory mount disconnect switch in control panel.

#### **2.02 PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS**

- A. General: Roof mounted units having gas burner and electric refrigeration that are 7.5 tons to 25 tons in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

- C. Disconnect Switch: Factory mount disconnect switch in control panel.

### **2.03 CASING**

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.

### **2.04 FANS**

- A. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted. Provide with high efficiency motor or direct drive as indicated. Isolate complete fan assembly. See Section 23 05 48.

### **2.05 BURNERS**

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame-sensing device, and automatic 100 percent shutoff pilot.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

### **2.06 EVAPORATOR COIL**

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons

cooling capacity and larger.

### **2.07 CONDENSER COIL**

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

### **2.08 COMPRESSORS**

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

### **2.09 AIR FILTERS:**

- A. 2-inch thick, glass fiber disposable media in metal frames.

### **2.10 OPERATING CONTROLS**

- A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
  - 1. Include system selector switch heat-off-cool and auto-on fan control switch.
  - 2. Locate thermostat in room as indicated on drawings.
- B. Provide terminal strip on unit for connection of operating controls to remote panel by others.
- C. Provide remote-mounted auto-on fan control switch.

### **2.11 ROOF CURBS**

- A. Roof Mounting Curb: 14 inches high, galvanized steel, channel frame with gaskets, nailer strips.

**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 ductless systems.
- D. Controls.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

**1.03 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.
- F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Design Data: Indicate refrigerant pipe sizing.
- D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturers warranty for solid state ignition modules.

## **PART 2 PRODUCTS**

### **2.01 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 Drawings for additional requirements.
- C. Electrical Characteristics:
  - 1. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 05 83.

### **2.02 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.

- 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.
- C. Remote Actuators:

### **2.03 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: R-410A.
  - 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 23.1 and UL 207.
- 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.
- 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.
- 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 0 degrees F.

#### **2.04 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. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from setpoint.
3. Thermostat Display:
  - a. Actual room temperature.
  - b. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

### **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 NFPA 90A and NFPA 90B.

## **PART 1 - GENERAL**

### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### **1.02 SUMMARY**

- A. Section includes supplementary general requirements for the following:
1. Codes and Standards
  2. Conflicting Requirements
  3. Specifications and Drawing Conventions
  4. Fees, Permits, and Inspection
  5. Submittals
  6. Products
  7. Warranties
  8. Electrical License Requirement
  9. Operation and Maintenance Manuals
  10. Demolition, Salvage, and Waste
  11. General Coordination for Electrical Work
  12. Cutting and Patching
  13. Excavation and Trenching
  14. Painting
  15. Continuity Tests
  16. Connection Torque Tests
  17. Mechanical Operation Tests
  18. Rotational Tests

### **1.03 CODES, STANDARDS, AND REFERENCES**

- A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. Where specific code requirements apply, they shall be included in the job, whether or not specifically shown or elsewhere specified.
- B. The **latest applicable edition** of specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:

1. National Electrical Code
2. National Fire Protection Association's Recommended Practices
3. Local, City & State Codes & Ordinances
4. National Electrical Safety Code
5. Underwriter's Laboratories, Inc.
6. Illumination Engineering Society
7. Institute of Electrical & Electronic Engineers
8. Insulated Power Cable Engineers Association
9. National Electrical Manufacturers Association
10. Earthquake Requirement of the International Building Code
11. American Society for Testing Materials
12. Occupational Safety & Health Act
13. Service requirements of serving utility company
14. Americans with Disabilities Act (ADA)
15. ASHRAE / IESNA Standard 90.1
16. Arkansas Energy Code

#### **1.04 CONFLICTING REQUIREMENTS**

- A. Conflicting requirements: If compliance with standards, codes, regulations, and specifications establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

#### **1.05 SPECIFICATION AND DRAWING CONVENTIONS**

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

#### **1.06 FEES, PERMITS, AND INSPECTIONS**

- A. This Contractor shall be responsible for all costs incurred by any serving utility, municipal authority, and/or Owner for the relocation, removal, and installation of temporary or new services.
- B. The Contractor shall be responsible for coordinating and providing the exact service equipment and installation methods with the serving utility, municipal authority, and/or Owner prior to bidding. Failure to do so will not constitute sufficient grounds for an authorized change order to the project.

#### **1.07 PROJECT / SITE CONDITIONS:**

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions. The Architect / Owner reserves the right to relocate any device a maximum distance of 6' - 0" at the time of installation without an extra cost being incurred.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect / Engineer before proceeding.

#### **1.08 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual

Specification Sections.

1. The Contractor shall submit five (5) copies to the Architect for approval, a list of all equipment he proposes to furnish, together with descriptive literature, capacities, manufacturer's name, approximately delivery date and any other pertinent facts concerning the various items. The submittal shall consist of a tabulation of all items included, followed by catalog and data sheets, wiring diagrams, etc., all bound in one folder, loose leaf sheets will not be acceptable.
2. The equipment listed herein or on the drawings will be furnished as specified unless scheduled "or equal". If "or equal" is indicated, the product of any reputable manufacturer regularly engaged in the commercial production of the specified equipment will not be excluded on the basis of minor differences, provided all essential requirements of this specification relative to materials, limitations of available space for equipment, capacity, and performance are met. The Contractor shall be responsible for any and all additional costs required by modifications to architectural, structural, mechanical or electrical facilities, devices, systems, etc. resulting from the approved substitution.
3. Wherever the substituted equipment actually furnished under these specifications requires the use of larger connections, more connections, or a different connection arrangement than indicated on the drawings or specified under these specifications, the Contractor shall furnish a scaled drawing showing how he proposes to install substituted equipment. Drawings shall show clearances and be coordinated with other mechanical and electrical equipment in the space. Should a substitution require the Architect or Engineer to provide additional services to accommodate it, the Contractor shall be responsible for costs incurred by the Architect or Engineer.
4. All equipment having motors 1-1/2 horsepower and larger shall include have as part of the submittal package, a written description of the motor, manufacturer, model number and motor efficiency at full load. Failure to include motor data in the equipment submittal shall result in the automatic rejection of the submittal.
5. The Contractor shall submit shop drawings to the Architect in accordance with the schedule prepared by the General Contractor but not later than 45 calendar days after the date of the agreement. Failure to submit shop drawings within 45 days, shall disqualify the Contractor from substituting specified equipment.
6. The contractor shall not install any equipment or materials until the shop drawings for the equipment or materials have been approved.
7. The Contractor shall submit five (5) copies to the Architect for approval, a list of all equipment he proposes to furnish, together with descriptive literature,

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capacities, manufacturer's name, approximately delivery date and any other pertinent facts concerning the various items. The submittal shall consist of a tabulation of all items included, followed by catalog and data sheets, wiring diagrams, etc., all bound in one folder, loose leaf sheets will not be acceptable.

8. The equipment listed herein or on the drawings will be furnished as specified unless scheduled "or equal". If "or equal" is indicated, the product of any reputable manufacturer regularly engaged in the commercial production of the specified equipment will not be excluded on the basis of minor differences, provided all essential requirements of this specification relative to materials, limitations of available space for equipment, capacity, and performance are met. The Contractor shall be responsible for any and all additional costs required by modifications to architectural, structural, mechanical or electrical facilities, devices, systems, etc. resulting from the approved substitution.
  9. Wherever the substituted equipment actually furnished under these specifications requires the use of larger connections, more connections, or a different connection arrangement than indicated on the drawings or specified under these specifications, the Contractor shall furnish a scaled drawing showing how he proposes to install substituted equipment. Drawings shall show clearances and be coordinated with other mechanical and electrical equipment in the space. Should a substitution require the Architect or Engineer to provide additional services to accommodate it, the Contractor shall be responsible for costs incurred by the Architect or Engineer.
  10. All equipment having motors 1-1/2 horsepower and larger shall include have as part of the submittal package, a written description of the motor, manufacturer, model number and motor efficiency at full load. Failure to include motor data in the equipment submittal shall result in the automatic rejection of the submittal.
  11. The Contractor shall submit shop drawings to the Architect in accordance with the schedule prepared by the General Contractor but not later than 45 calendar days after the date of the agreement. Failure to submit shop drawings within 45 days, shall disqualify the Contractor from substituting specified equipment.
  12. The contractor shall not install any equipment or materials until the shop drawings for the equipment or materials have been approved.
  13. Engineer will return annotated file.
- B. Digital Data Files:
1. Electronic digital data files of the Project drawings may be provided by Engineer for Contractor's use in preparing submittals.
  2. Electronic digital data files supplied for use in submittal preparation will be subject to terms and conditions of the Engineer's Release Form. A signed release form and any payment required must be returned to the Engineer prior to the transmission of an electronic digital data files.

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3. Electronic digital data file formats may include AutoCAD drawings, Revit converted to AutoCAD drawings or Revit Model.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Resubmittal Review: Allow 14 days for review of each resubmittal.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Name file with submittal number or other unique identifier, including revision identifier.
  2. Transmittal Form for Electronic Submittals: Use electronic form containing the following information:
    - a. Project name.
    - b. Name and address of Engineer.
    - c. Name of Construction Manager.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Specification Section number and title.
    - i. Indication of full or partial submittal.
    - j. Remarks.
- F. Options: Identify options requiring selection by Engineer.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of revision in label or title block and clearly indicate extent of revision.
2. Resubmit submittals until they are marked with approval notation from Engineer.

#### **1.09 CLOSEOUT SUBMITTALS**

A. Closeout submittals shall include, but not limited to, the following:

1. Operation and Maintenance Materials
2. Record Drawings
3. Demonstration and Training Materials

#### **1.10 QUALITY ASSURANCE**

A. Products:

1. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - a. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - b. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

#### **1.11 PRODUCT DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.



C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation or moisture damage.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

**1.12 PRODUCT WARRANTIES**

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Submit warranties in accordance with "Closeout Procedures."

**1.13 FIELD CONDITIONS**

A. The Contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause of extras after the contract is signed, by reason of unforeseen conditions.

**1.14 GUARANTEE/WARRANTY**

- A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.
- B. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of 1 full year after acceptance by the Engineer and Owner. Regardless of anything to the contrary in warranties by the equipment manufacturer involved, the Contractor's warranty shall run for 1 full year after final acceptance by the Engineer.

#### **1.15 ELECTRICAL LICENSE REQUIREMENT**

- A. No person shall perform electrical work on the contract without possessing a Master's or Journeyman's License from the State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.
- B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

### **PART 1 PRODUCTS**

#### **2.01 SUBMITTAL PROCEDURES**

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals to Engineer.
  - a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. Mark each copy of each submittal to show which products and options are applicable.
  2. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
  3. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale and sufficiently large to show all pertinent features of the item, method of connections, and notations clearly legible. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.
  1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.

## **2.02 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and

design criteria indicated.

### **2.03 PRODUCT SELECTION PROCEDURES**

A. General Product Requirements: Provide products that comply with the Contract

Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Where two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Products containing asbestos shall not be used.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience shall be considered.
4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with

requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

#### **2.04 COMPARABLE PRODUCTS**

- A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  3. Evidence that proposed product provides specified warranty.
  4. Contractor is responsible for any modification required by products other than the basis of design product at no additional cost to the owner including but not limited to modifications to supports and connections.

#### **2.05 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. After approval of materials and equipment for use in this project, a copy of an Operation and Maintenance Manual shall be submitted for approval.
- B. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
  2. List of equipment.
  3. Table of contents.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Upon final approval, submit one (1) bound copy of the approved Operation and Maintenance Manual to the Architect and hold two (2) copies for instruction of Owner as hereinafter specified.

## **2.06 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

## **2.07 EQUIPMENT AND MATERIALS:**

- A. All materials shall be new and shall bear the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material.
- The equipment to be furnished under each section of the specification shall be essentially the standard product of a manufacturer regularly engaged in the production

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of the required type of equipment, and shall be the manufacturer's latest approved design.

- B. When 2 or more units of materials or equipment of the same type or class are required, these units shall be products of 1 manufacturer. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance. Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
- C. Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- D. Asbestos products or equipment or materials containing asbestos shall not be used.
- E. Equipment and materials shall be delivered to the site and stored in the original containers, suitably sheltered from the elements. Items subject to moisture damage (such as controls) shall be stored in dry, heated spaces.
- F. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly. Damage or defects developing before acceptance of the work shall be made good at the Contractor's expense.
- G. It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. The Contractor shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and

meaning of the Drawings and Specifications.

- H. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. Should the Contractor perform any work that does not comply with the manufacturer's directions, he shall bear all costs arising in correcting the deficiencies.

**2.08 EQUIPMENT ACCESSORIES:**

- A. The Contractor shall furnish and install all equipment, accessories, connections, and incidental items necessary to fully complete the work, ready for use, occupancy and operation by the Owner, whether or not specifically shown on the plans or herein specified.
- B. Connections: All final connections to equipment shall be installed as required by the manufacturer and/or Vendor.
- C. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all incidental changes. The Contractor shall provide any additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.



## **PART 1 - EXECUTION**

### **3.01 CONTRACTOR'S SUBMITTAL REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### **3.02 ENGINEER'S SUBMITTAL ACTION**

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it.
- B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- D. Submittals not required by the Contract Documents may be returned by the Engineer without action.

### **3.03 DISPOSAL OF WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or

incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Disposal: Remove waste materials from Owner's property and legally dispose of them

### **3.04 RECORD DRAWING RECORDING AND MAINTENANCE**

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

### **3.05 COORDINATION OF WORK**

- A. The Contractor shall compare the Electrical Drawings and Specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the Electrical Work. The Electrical Work shall be installed in cooperation with other trades installing related work. Before installation, the Contractor shall make proper provision to avoid interferences. All changes required in the work of the Contractor caused by a failure to coordinate the work with other trades shall be made by the Contractor at his own expense.
- B. Anchor bolts, sleeves, inserts and supports that may be required for the Electrical Work shall be furnished under the same section of the specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them, which trade shall also insure that they are properly installed. Any expense resulting

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from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor under the section of the specifications for the trade with the responsibility for directing their proper location.

- C. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located, and shall do any cutting and patching caused by the neglect to do so. Slots, chases, openings and recesses in existing structure shall be cut by the trade requiring them and patched and repaired by that trade.
- D. Locations of conduits, equipment, etc. shall be adjusted to accommodate the work and to avoid interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe and duct prior to fabrication.
1. Installation and Arrangement: The Contractor shall install all Electrical Work to permit removal (without damage to other parts) of coils, heat exchanger bundles, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The Contractor shall arrange pipes and equipment to permit ready access to valves, cocks, control components and to clear the openings of swinging and overhead doors and of access panels.
  2. Access: The Contractor shall provide all necessary access panels in walls, ceilings, equipment, etc., as required for inspection of interiors and for proper maintenance and or installation of equipment valves. Where changes from the plans are made by the Contractor in the installation of his work, he shall provide any and all access panels required as a result of these changes.
- E. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the

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Contractor shall make all incidental changes in conduit, back box, device locations, etc. The Contractor shall provide any additional conduit, fittings, and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.

- F. Connections: All conduit connecting to equipment shall be installed without strain at the conduit connection
- G. Inaccessible Equipment
  - 1. Where the Engineer or Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action (such as providing access panels) performed as directed at no additional cost to the Owner.
  - 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.
- H. Electrical Coordination
  - 1. Power: All power and motor wiring shall be performed under Division 26 unless otherwise noted for specific items. Control and interlock wiring shall be done by the Contractor of this Division.
  - 2. Starters and Drives: All motor starters and drives unless included in other sections of the specifications shall be by Division 26. Furnish auxiliary contacts on magnetic starters to permit interlocking of starting circuits.
  - 3. Disconnects: All equipment furnished under this Division required to have a means of disconnect shall be supplied with a disconnect or a disconnect shall be furnished and installed by Division 26.
- I. Dedicated Electrical Space: The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the

structural ceiling, whichever is lower, shall be dedicated to the electrical installation.

No piping, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in foreign systems.

Every effort shall be made to eliminate foreign systems above equipment to the structural ceiling. If this is not possible, the Contractor shall encase any pipe in a second pipe with a minimum number of joints.

- J. Lubrication: The Contractor shall be held responsible for all damage to bearings while the equipment is being operated up to the date of acceptance of the equipment. The Contractor shall be required to protect all bearings during installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. Fan shafts, pump shafts, motor shafts, etc. shall be coated to prevent deterioration in moist or wet atmospheres.

### **3.06 CUTTING AND PATCHING**

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Under each section of the specifications, the Contractor shall be responsible for all required cutting, etc., incident to his work under that section, and shall make all satisfactory repairs, but in no case shall the Contractor cut into any major structural element, beam or column.
  2. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades because of fault, error or tardiness or because of any damage done by own workmanship.

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3. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements the “Occupant Coordination” article.
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### **3.07 EXCAVATION AND TRENCHING FOR ELECTRICAL CONDUIT**

- A. The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other methods. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if the conduit or sleeves can be safely and properly installed and backfill can be properly tamped in such tunnel sections.
- B. Trench Excavation: Trenches shall be of necessary width for proper laying of the conduit, and the banks shall be as nearly vertical as practical. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for the conduit on undisturbed soil at every point along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are required, the rock shall be excavated to a minimum overdepth of 4

inches below the trench depths indicated on the drawings, or specified. Overdepths in the rock excavation and unauthorized overdepths shall be backfilled with loose, granular, moist earth, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade coarse sand, fine gravel or other suitable materials, as hereinafter specified.

- C. Depth of Cover: Trenches for utilities shall be of a depth that will provide the following minimum depths of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown. Exact depth of cover by Utility.
- D. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense.

### **3.08 BACKFILLING OF TRENCHES**

- A. Trenches shall not be backfilled until the utilities systems as installed confirm to the requirements of the drawings and specifications.
- B. Normal Backfill: Where compacted backfill is not specified the trenches shall be carefully backfilled with the materials approved for backfilling (See appropriate section), deposited in 6" layers and thoroughly and carefully rammed until the pipe has a cover of not less than one foot. The remainder of the backfill material shall then be carefully placed in the trench in one foot layers and tamped. Settling the backfill with water will not be permitted. The surface shall be graded to a reasonable uniformity and



the mounding over trenches left in a uniform and neat condition. Surface condition shall be equipment to match the existing condition prior to trenching (sod, asphalt, etc.).

- C. Compacted backfill shall be used under slabs on grade, building structure, concrete paving and asphaltic concrete paving. The soils used in the fill shall be granular in nature and shall not contain roots, sod, rubbish or stones over 1-1/2" maximum dimension.

### **3.09 PAINTING**

- A. The Contractor shall remove all rust, oil and grease from exposed surfaces and clean all apparatus or materials specified to be painted under this section of the specifications.

Equipment specified to have factory finishes shall be protected until completion of the Contract, with Contractor being responsible for maintaining finishes.

- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
1. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
  2. Galvanized surfaces damaged during installation shall be repaired with a galvanized repair compound. Any equipment scratched, marred or damaged will be repainted to the original condition.

### **3.10 CONTINUITY TEST:**

- A. The Contractor shall perform a continuity test on the affected portion of the electrical system prior to energizing the system to insure proper cable connections.

### **3.11 CONNECTION TORQUE TESTS:**

- A. All larger conductor bolted connections shall be torque tested using a torque wrench.

Torque shall be to National Electrical Testing Association's (NETA) Standards.

### **3.12 MECHANICAL OPERATION TESTS:**

- A. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are functioning.

**3.13 ROTATIONAL TESTS:**

- A. The Contractor shall assist all other trades in performing rotational tests on all motors provided under this contract. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor's color coding shall be changed.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Metal-clad cable.
- E. Power and control tray cable.
- F. Variable-frequency drive cable.
- G. Wiring connectors.
- H. Electrical tape.
- I. Heat shrink tubing.
- J. Oxide inhibiting compound.
- K. Wire pulling lubricant.
- L. Cable ties.
- M. Firestop sleeves.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

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- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- H. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- S. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- T. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

### **1.08 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. Nonmetallic-sheathed cable is not permitted.
- D. Armored cable is not permitted.
- E. Metal-clad cable is permitted only as follows:
  - 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**

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- 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. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- H. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- K. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.



L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

M. 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.
  - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
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.
    - 2) Phase B: Red.
    - 3) Phase C: Blue.
    - 4) Neutral/Grounded: White.
  - c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
    - 1) Phase A: Black.
    - 2) Phase B (High-Leg): Orange.
    - 3) Phase C: Blue.
    - 4) Neutral/Grounded: White.
  - d. 240/120 V, 1 Phase, 3 Wire System:
    - 1) Phase A: Black.
    - 2) Phase B: Red.
    - 3) Neutral/Grounded: White.
  - e. Equipment Ground, All Systems: Green.
  - f. Travelers for 3-Way and 4-Way Switching: Pink.
  - g. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
  - h. For control circuits, comply with manufacturer's recommended color code.

### **2.03 SINGLE CONDUCTOR BUILDING WIRE**

A. Manufacturers:

1. Copper Building Wire:

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- a. Encore Wire Corporation
  - b. General Cable Technologies Corporation
  - c. Southwire Company
  - d. Advance Wire and Cable, Inc
- 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.
    - a. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

**2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE: COPPER**

- A. Manufacturers:
- 1. Encore Wire Corporation
  - 2. Southwire Company
  - 3. General Cable Technologies Corporation.
  - 4. Advance Wire and Cable
- B. Description: NFPA 70, Type THWN in conduit
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
- 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.

**2.05 SERVICE ENTRANCE CABLE**

- A. Manufacturers:
- 1. Copper Service Entrance Cable:

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- a. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  - b. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
  - c. General Cable Technologies Corporation.
  - d. Advance Wire and Cable, Inc.
- B. Service Entrance Cable for Underground Use: NFPA 70, single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
- C. Conductor Stranding: Stranded.
- D. Insulation Voltage Rating: 600 V.

**2.06 METAL-CLAD CABLE: LIMITED USE**

- A. Manufacturers:
- 1. AFC Cable Systems Inc
  - 2. Encore Wire Corporation
  - 3. Southwire Company
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
- 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.

**2.07 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.

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LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- B. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors, mechanical connectors, or compression connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- C. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. 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.
  - 1. Manufacturers:
    - a. 3M
    - b. Ideal Industries, Inc
    - c. NSI Industries LLC
- G. Mechanical Connectors: Provide bolted type or set-screw type.
  - 1. Manufacturers:
    - a. Burndy LLC
    - b. Ilsco
    - c. Thomas & Betts Corporation

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

1. Manufacturers:
  - a. Burndy LLC
  - b. IlSCO
  - c. Thomas & Betts Corporation

## **2.08 ACCESSORIES**

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
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.
3. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

1. Manufacturers:
  - a. 3M:
  - b. American Polywater Corporation
  - c. Ideal Industries, Inc:

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
  - 1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

### **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. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  - 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

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6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
  - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
  - b. Increase size of conductors as required to account for ampacity derating.
  - c. Size raceways, boxes, etc. to accommodate conductors.
7. 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.
8. Provide oversized neutral/grounded conductors where indicated and as specified below.
  - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
  - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. 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.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. 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.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
  2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- J. Install conductors with a minimum of 12 inches of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. 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.



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- O. 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.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- S. 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.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Chemically-enhanced ground electrodes.
- G. Ground plate electrodes.
- H. Ground enhancement material.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

**1.03 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. 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.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

### **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. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. ANSI/IEEE Compliance: Comply with C114.1 (IEEE Std 142) and IEEE Stds Nos. 241 and 242 pertaining to grounding and ground-fault protection of power systems.
- E. ANSI/UL Compliance: Comply with requirements of ANSI/UL and UL standards pertaining to grounding and ground-fault protection equipment and devices. Provide products which have been UL-listed and labeled.
- F. NEMA Compliance: Comply with NEMA Stds Pub Nos. PB 1.2 and AB 1, pertaining to construction and installation of ground-fault protection devices and molded-case circuit breakers.

### **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**

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- 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. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of

SECTION 26 05 26  
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- entrance to the building.
  - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
  - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
- a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
- a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
- a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
  - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
  - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- G. Service-Supplied System Grounding:
- 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
  - 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Separately Derived System Grounding:
- 1. Separately derived systems include, but are not limited to:
    - a. Transformers (except autotransformers such as buck-boost transformers).
    - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
    - c. Generators, when neutral is switched in the transfer switch.

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2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
  4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
  5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
  6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- I. 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. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
  8. Provide bonding for metal building frame.

- J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    - b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- K. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
  4. Manufacturers - Mechanical and Compression Connectors:
    - a. Advanced Lightning Technology (ALT)



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- b. Burndy LLC
- c. Harger Lightning & Grounding
- d. Thomas & Betts Corporation
- 5. Manufacturers - Exothermic Welded Connections:
  - a. Burndy LLC
  - b. Cadweld, a brand of Erico International Corporation
  - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC
- D. Ground Bars:
  - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  - 2. Size: As indicated.
  - 3. Holes for Connections: As indicated or as required for connections to be made.
  - 4. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Harger Lightning & Grounding
    - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC
- E. Ground Rod Electrodes:
  - 1. Comply with NEMA GR 1.
  - 2. Material: Copper-bonded (copper-clad) steel.
  - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
  - 4. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Galvan Industries, Inc
    - d. Harger Lightning & Grounding
- F. Chemically-Enhanced Ground Electrodes:
  - 1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.
  - 2. Length: 10 feet.
  - 3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
  - 4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.
  - 5. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation

- c. Harger Lightning & Grounding
- G. Ground Plate Electrodes:
  - 1. Material: Copper.
  - 2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
  - 3. Manufacturers:
    - a. Advanced Lightning Technology (ALT)
    - b. Erico International Corporation
    - c. Harger Lightning & Grounding
    - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC
- H. Ground Enhancement Material:
  - 1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
  - 2. Manufacturers:
    - a. Erico International Corporation
    - b. Harger Lightning & Grounding
    - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC

### **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. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

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1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. 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.
- F. Identify grounding and bonding system components in accordance with Section 26 05 53.
- G. Neutrals of lighting systems shall be grounded independently and in accordance with the National Electrical Code.
- H. All metal raceway system, including cabinets, conduit and boxes, shall be grounded to a water pipe with UL approved grounding clamp in accordance with the National Electrical Code.
- I. An equipment ground conductor shall be installed in all conduits.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.

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- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26 05 36 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
- E. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- G. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety 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 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.
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 30 00.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

## **1.06 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

## **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. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical 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.
  - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Components for Vibration Isolation and/or Seismic Controls: Comply with Section 26 05 48.



SECTION 26 05 29  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
  3. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation
    - b. Erico International Corporation
    - c. HoldRite, a brand of Reliance Worldwide Corporation
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation
    - b. Erico International Corporation
    - c. HoldRite, a brand of Reliance Worldwide Corporation
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
  2. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
  3. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
  4. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation
    - b. Thomas & Betts Corporation
    - c. Unistrut, a brand of Atkore International Inc
- F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Busway Supports: 1/2 inch diameter.
    - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
    - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
    - e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
    - f. Outlet Boxes: 1/4 inch diameter.
    - g. Luminaires: 1/4 inch diameter.
- G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber 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.

1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
4. Manufacturers:
  - a. Cooper B-Line, a division of Eaton Corporation
  - b. Erico International Corporation
  - c. PHP Systems/Design
  - d. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).

H. 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 Stud Walls: Use toggle bolts.
5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
6. Sheet Metal: Use sheet metal screws.
7. Wood: Use wood screws.
8. Plastic and lead anchors are not permitted.
9. Powder-actuated fasteners are not permitted.
10. Hammer-driven anchors and fasteners are not permitted.
11. 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. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
  - d. Manufacturer: Same as manufacturer of metal channel (strut) 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. Perform work in accordance with NECA 1 (general workmanship).
- 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. Provide required vibration isolation and/or seismic controls in accordance with Section 26 05 48.
- H. Field-Welding (where approved by Architect): Comply with Section 05 50 00.
- I. 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.

- J. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- K. Secure fasteners according to manufacturer's recommended torque settings.
- L. Remove temporary supports.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

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**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Intermediate metal conduit (IMC).
- D. PVC-coated galvanized steel rigid metal conduit (RMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Conduit fittings.
- J. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

G. Section 27 10 00 - Structured Cabling: Additional requirements for communications systems conduits.

H. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

### **1.03 REFERENCE STANDARDS**

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2015.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2018.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.

K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.

- M. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- P. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- Q. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- R. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- S. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- T. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- U. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- V. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- W. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- X. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- Y. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.



#### **1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any 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 is complete between outlet, junction and splicing points.

#### **1.05 SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:

1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

#### **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 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 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
  5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
  6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to

provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.

7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:

1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

1. Locations subject to physical damage include, but are not limited to:
  - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
  - b. Where exposed below 20 feet in warehouse areas.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit, aluminum rigid metal conduit, or reinforced thermosetting resin conduit (RTRC).
  1. Corrosive locations include, but are not limited to:
    - a. Cooling towers.
- N. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- O. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
  1. Maximum Length: 6 feet.
- P. Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit.
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  3. Maximum Length: 6 feet unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.

## **2.02 CONDUIT REQUIREMENTS**

- A. 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 a mandrel through them.

- B. Electrical Service Conduits: Also comply with Section 26 21 00.
- C. Communications Systems Conduits: Also comply with Section 27 10 00.
- D. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
- E. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
- G. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
  - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  - 3. Control Circuits: 1/2 inch (16 mm) trade size.
  - 4. Underground, Interior: 3/4 inch (21 mm) trade size.
  - 5. Underground, Exterior: 1 inch (27 mm) trade size.
- H. 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
  - 2. Republic Conduit
  - 3. Wheatland Tube, a Division of Zekelman Industries
- 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. Bridgeport Fittings Inc
    - b. O-Z/Gedney, a brand of Emerson Electric Co
    - c. Thomas & Betts Corporation
  - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

#### **2.04 ALUMINUM RIGID METAL CONDUIT (RMC)**

A. Manufacturers:

1. Allied Tube & Conduit
2. Republic Conduit
3. Wheatland Tube, a Division of Zekelman Industries

- B. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

C. Fittings:

1. Manufacturers:

- a. Bridgeport Fittings Inc
- b. O-Z/Gedney, a brand of Emerson Electric Co
- c. Thomas & Betts Corporation

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use aluminum.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

#### **2.05 INTERMEDIATE METAL CONDUIT (IMC)**

A. Manufacturers:

1. Allied Tube & Conduit
2. Republic Conduit
3. Wheatland Tube, a Division of Zekelman Industries

- 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. Bridgeport Fittings Inc

- b. O-Z/Gedney, a brand of Emerson Electric Co
- c. Thomas & Betts Corporation
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

## **2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

### **A. Manufacturers:**

1. Thomas & Betts Corporation
2. Robroy Industries

- ### **B. Description:** NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

- ### **C. Exterior Coating:** Polyvinyl chloride (PVC), nominal thickness of 40 mil.

### **D. PVC-Coated Fittings:**

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

- ### **E. PVC-Coated Supports:** Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

## **2.07 FLEXIBLE METAL CONDUIT (FMC)**

### **A. Manufacturers:**

1. AFC Cable Systems, Inc
2. Electri-Flex Company

3. International Metal Hose
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc
    - b. O-Z/Gedney, a brand of Emerson Electric Co
    - c. Thomas & Betts Corporation
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Manufacturers:
  1. AFC Cable Systems, Inc
  2. Electri-Flex Company
  3. International Metal Hose
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc
    - b. O-Z/Gedney, a brand of Emerson Electric Co
    - c. Thomas & Betts Corporation
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

## **2.09 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  1. Allied Tube & Conduit



2. Republic Conduit
  3. Wheatland Tube, a Division of Zekelman Industries
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
1. Manufacturers:
    - a. Bridgeport Fittings Inc
    - b. O-Z/Gedney, a brand of Emerson Electric Co
    - c. Thomas & Betts Corporation
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  4. Connectors and Couplings: Use compression (gland) type.
    - a. Do not use indenter type connectors and couplings.
    - b. Do not use set-screw type connectors and couplings.
  5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

## **2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Manufacturers:
1. Cantex Inc
  2. Carlon, a brand of Thomas & Betts Corporation
  3. JM Eagle
- 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.

## **2.11 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc
  - 2. Electri-Flex Company
  - 3. International Metal Hose
- B. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- C. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

## **2.12 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)**

- A. Manufacturers:
  - 1. Champion Fiberglass, Inc
  - 2. FRE Composites
  - 3. United Fiberglass of America, Inc
- B. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- C. Supports: Per manufacturer's recommendations.
- D. Fittings: Same type and manufacturer as conduit to be connected.
  - 1. Cement-Tight Joints: Use bonded coupling or bell and spigot.
  - 2. Cement- and Water-Tight Joints: Use adhesive and manufacturer's standard gaskets.

## **2.13 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- G. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
  - 1. Products:
    - a. Menzies Metal Products; Electrical Roof Stack and Cap
    - b. Menzies Metal Products; Electrical Retro Box
- I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
  - 1. Manufacturers:
    - a. Quickflash Weatherproofing Products, Inc
- J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
  - 1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).

- K. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
  - 1. Products:
    - a. Advance Products & Systems, LLC; Duct Bank Spacers
- L. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for the casing and conduit/duct arrangement to be installed.
  - 1. Products:
    - a. Advance Products & Systems, LLC; Bore Spacers

### **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. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

I. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. 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.
5. Unless otherwise approved, do not route conduits exposed:
  - a. Across floors.
  - b. Across roofs.
  - c. Across top of parapet walls.
  - d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
  - a. Heaters.
  - b. Hot water piping.
  - c. Flues.
14. Group parallel conduits in the same area together on a common rack.

J. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required vibration isolation and/or seismic controls in accordance with Section 26 05 48.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Use conduit strap to support single surface-mounted conduit.
  - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
10. Use of spring steel conduit clips for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

K. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

L. 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. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. 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. Include proposed locations of penetrations and methods for sealing with submittals.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

M. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
  - a. Underground, Exterior: 24 inches.
  - b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

N. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

1. Secure conduits to prevent floating or movement during pouring of concrete.

O. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

P. 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 calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
  4. Where conduits are subject to earth movement by settlement or frost.
- Q. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
  3. Where conduits penetrate coolers or freezers.
- R. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- S. Provide grounding and bonding in accordance with Section 26 05 26.
- T. Identify conduits in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

### **3.04 CLEANING**



- A. Clean interior of conduits to remove moisture and foreign matter.

**3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**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.
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Boxes for hazardous (classified) locations.
- E. Floor boxes.
- F. Underground boxes/enclosures.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 84 00 - Firestopping.
- C. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- E. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- F. Section 26 05 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- G. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

- H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Poke-through assemblies.
  - 4. Access floor boxes.
  - 5. Additional requirements for locating boxes for wiring devices.
- J. Section 27 10 00 - Structured Cabling: Additional requirements for communications systems outlet boxes.
- K. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes: Concrete manholes for electrical systems.

### **1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - UL Standard for Safety Industrial Control Panels; 2018.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

- 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
- 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
- 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
- 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
- 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
- 6. Coordinate the work with other trades to preserve insulation integrity.
- 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
- 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

#### **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 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. Minimum Box Size, Unless Otherwise Indicated:
  - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
  - b. Communications Systems Outlets: Comply with Section 27 10 00.
  - c. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
  - d. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
13. Wall Plates: Comply with Section 26 27 26.
14. Manufacturers:
  - a. Hubbell Incorporated; Bell Products
  - b. Hubbell Incorporated; RACO Products
  - c. O-Z/Gedney, a brand of Emerson Electric Co
  - d. Thomas & Betts Corporation

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  6. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation
    - b. Hoffman, a brand of Pentair Technical Products
    - c. Hubbell Incorporated; Wiegmann Products
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Manufacturers:
    - a. Hubbell Incorporated
- E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
1. Manufacturers:
    - a. Appleton, a brand of Emerson Electric Co
    - b. Cooper Crouse-Hinds, a division of Eaton Corporation
    - c. Hubbell Incorporated; Killark Products
- F. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete

installation.

2. Use cast iron floor boxes within slab on grade.
3. Use sheet-steel or cast iron floor boxes within slab above grade.
4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
5. Manufacturer: Same as manufacturer of floor box service fittings.

G. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Provide logo on cover to indicate type of service.
5. Applications:
  - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
  - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
  - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
  - a. Manufacturers:
    - 1) Hubbell Incorporated; Quazite Products:  
[www.hubbellpowersystems.com/#sle](http://www.hubbellpowersystems.com/#sle).
    - 2) MacLean Highline: [www.macleanhighline.com/#sle](http://www.macleanhighline.com/#sle).
    - 3) Oldcastle Precast, Inc: [www.oldcastleprecast.com/#sle](http://www.oldcastleprecast.com/#sle).
  - b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
  - c. Product(s):
    - 1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
    - 2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
    - 3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

## 2.02 ACCESSORIES



- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
  - 1. Manufacturers:
    - a. Quickflash Weatherproofing Products, Inc:  
[www.quickflashproducts.com/#sle](http://www.quickflashproducts.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. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
  - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
  - b. Communications Systems Outlets: Comply with Section 27 10 00.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
  - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
  - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
  - a. Concealed above accessible suspended ceilings.
  - b. Within joists in areas with no ceiling.
  - c. Electrical rooms.
  - d. Mechanical equipment rooms.

I. Box Supports:

SECTION 26 05 33.16  
BOXES FOR ELECTRICAL SYSTEMS

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide required seismic controls in accordance with Section 26 05 48.
  3. 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.
  4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch 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.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
  2. Flush-mount enclosures located in concrete or paved areas.
  3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
  4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

- P. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- R. Close unused box openings.
- S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- T. Provide grounding and bonding in accordance with Section 26 05 26.
- U. Identify boxes in accordance with Section 26 05 53.

### **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.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 91 13 - Exterior Painting.
- B. Section 09 91 23 - Interior Painting.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.
- E. Section 26 23 00 - Low-Voltage Switchgear: Factory-installed mimic bus.
- F. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.
- G. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2018.
- C. 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 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.07 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. Switchgear:
    - 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) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
  - b. Switchboards:
    - 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) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
  - c. 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. Identify spares and spaces.
  - d. Transformers:
    - 1) Identify kVA rating.
    - 2) Identify voltage and phase for primary and secondary.
    - 3) Identify power source and circuit number. Include location when not within sight of equipment.
    - 4) Identify load(s) served. Include location when not within sight of equipment.
  - e. Enclosed switches, circuit breakers, and motor controllers:
    - 1) Identify voltage and phase.
    - 2) Identify power source and circuit number. Include location when not within sight of equipment.



- 3) Identify load(s) served. Include location when not within sight of equipment.
  2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
  3. Emergency System Equipment:
    - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
  4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
  5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    - a. Service equipment.
    - b. Industrial control panels.
    - c. Motor control centers.
    - d. Elevator control panels.
    - e. Industrial machinery.
  6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    - a. Minimum Size: 3.5 by 5 inches.
    - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    - c. Service Equipment: Include the following information in accordance with NFPA 70.
      - 1) Nominal system voltage.
      - 2) Available fault current.
      - 3) Clearing time of service overcurrent protective device(s).
      - 4) Date label applied.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
  2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.

3. 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.
  4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
  5. Use underground warning tape to identify direct buried cables.
- C. Identification for Raceways:
1. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
    - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      - 1) Color Code:
        - (a) Emergency Power System: Red.
      - 2) Field-Painting: Comply with Section 09 91 23 and 09 91 13.
      - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
  2. Use underground warning tape to identify underground raceways.
- D. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 00.

## **2.02 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Identification Nameplates:
1. Manufacturers:
    - a. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
    - b. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
    - c. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  2. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  3. 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.
  4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
  5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

6. 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
  - b. Brother International Corporation
  - c. Panduit Corp
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.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
  - a. System designation where applicable:
    - 1) Emergency Power System: Identify with text "EMERGENCY".
    - 2) Fire Alarm System: Identify with text "FIRE ALARM".
  - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
  - a. System Designation: 1 inch.
  - b. Equipment Designation: 1/2 inch.
5. Color:
  - a. Normal Power System: White text on black background.
  - b. Emergency Power System: White text on red background.
  - c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

### **2.03 WIRE AND CABLE MARKERS**

A. Manufacturers:

1. Brady Corporation
2. HellermannTyton

3. Panduit Corp
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

#### **2.04 VOLTAGE MARKERS**

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Minimum Size:
  1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
- C. Legend:
  1. Markers for System Identification:
    - a. Emergency Power System: Text "EMERGENCY".
- D. Color: Black text on orange background unless otherwise indicated.

#### **2.05 UNDERGROUND WARNING TAPE**

- A. Manufacturers:
  1. Brady Corporation
  2. Brimar Industries, Inc

3. Seton Identification Products
- B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
  1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
- C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- E. Legend: Type of service, continuously repeated over full length of tape.
- F. Color:

## **2.06 WARNING SIGNS AND LABELS**

- A. Manufacturers:
  1. Brimar Industries, Inc
  2. Clarion Safety Systems, LLC
  3. Seton Identification Products
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
  1. Materials:
  2. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. 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. Conduits: Legible from the floor.
  - 8. Conductors and Cables: Legible from the point of access.
  - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

SECTION 26 05 53  
IDENTIFICATION FOR ELECTRICAL SYSTEMS

## **PART 1 - GENERAL**

### **1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

### **1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 27 26 - Wiring Devices.
- E. Section 26 28 16.16 - Enclosed Switches.
- F. Section 26 29 13 - Enclosed Controllers.

### **1.03 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

### **1.05 QUALITY ASSURANCE**



- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Comply with NEMA WD 1.
  - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 33.13.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 33.16.

### **2.02 EQUIPMENT CONNECTIONS**

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical service requirements.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 33.13 - Conduit for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 23 00 - Low-Voltage Switchgear: Service entrance equipment.
- H. Section 26 24 13 - Switchboards: Service entrance equipment.
- I. Section 26 24 16 - Panelboards: Service entrance equipment.
- J. Section 26 28 16.16 - Enclosed Switches: Service entrance equipment.
- K. Section 26 36 00 - Transfer Switches: Service entrance equipment.
- L. Section 26 43 00 - Surge Protective Devices: Service entrance surge protective devices.
- M. Section 31 23 16 - Excavation.
- N. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- O. Section 31 23 23 - Fill: Bedding and backfilling.
- P. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

**1.03 DEFINITIONS**

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

#### **1.04 REFERENCE STANDARDS**

- A. IEEE C2 - National Electrical Safety Code; 2017.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
  - 1. Verify the following with Utility Company representative:
    - a. Utility Company requirements, including division of responsibility.
    - b. Exact location and details of utility point of connection.
    - c. Utility easement requirements.
    - d. Utility Company charges associated with providing service.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
  - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.

- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
  - 1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
  - 2. Arrange for inspections necessary to obtain Utility Company approval of installation.

### **1.06 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual locations of equipment and installed service routing.

### **1.07 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. IEEE C2 (National Electrical Safety Code).
  - 2. NFPA 70 (National Electrical Code).
  - 3. The requirements of the Utility Company.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

## **PART 2 - PRODUCTS**

### **2.01 ELECTRICAL SERVICE REQUIREMENTS**

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: As indicated on drawings.
- D. Division of Responsibility:
  - 1. Pad-Mounted Utility Transformers:
    - a. Transformer Vaults and Pads: Furnished and installed by Contractor per Utility Company requirements.
    - b. Transformers: Furnished and installed by Utility Company.
    - c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
    - d. Primary:
      - 1) Trenching and Backfilling: Provided by Contractor.
      - 2) Conduits: Furnished and installed by Contractor.
      - 3) Conductors: Furnished and installed by Utility Company.
    - e. Secondary:
      - 1) Trenching and Backfilling: Provided by Contractor.
      - 2) Conduits: Furnished and installed by Contractor.
      - 3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
  - 2. Pole-Mounted Utility Transformers:
    - a. Utility Poles: Furnished and installed by Utility Company.
    - b. Transformers: Furnished and installed by Utility Company.
    - c. Transformer Grounding Provisions: Furnished and installed by Utility Company.
    - d. Primary: Furnished and installed by Utility Company.
    - e. Secondary - Underground Service:
      - 1) Conduits: Furnished and installed by Contractor

- 2) Conductors: Furnished and installed by Contractor (Service Point at utility pole).
- f. Secondary - Overhead Service:
  - 1) Conduits/Service Masts: Furnished and installed by Contractor.
  - 2) Conductors: Furnished and installed by Contractor (Service Point at service mast).
3. Terminations at Service Point: Provided by Utility Company.
4. Metering Provisions:
  - a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
  - b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
  - c. Metering Compartments in Service Entrance Equipment: Furnished and installed by Contractor per Utility Company requirements.
  - d. Metering Transformers: Furnished and installed by Utility Company.
  - e. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.
  - f. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.
  - g. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Verify and mark locations of existing underground utilities.

#### **3.03 INSTALLATION**



SECTION 26 21 00  
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.
- E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.
- F. Provide required protective bollards in accordance with Utility Company requirements.
- G. Provide required support and attachment components in accordance with Section 26 05 29.
- H. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.
- I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

**3.04 PROTECTION**

- A. Protect installed equipment from subsequent construction operations.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 25 36 13 - Integrated Automation Power Meters: Smart (AMI and AMR) Meters.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- G. Section 26 21 00 - Low-Voltage Electrical Service Entrance.
- H. Section 26 23 00 - Low-Voltage Switchgear.
- I. Section 26 27 13 - Electricity Metering: For interface with equipment specified in this section.
- J. Section 26 28 13 - Fuses: Fuses for fusible switches.
- K. Section 26 43 00 - Surge Protective Devices.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- L. UL 891 - Switchboards; Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces

- and working clearances required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
  5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
  2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
  3. Obtain Utility Company approval of switchboard prior to fabrication.
  4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
  5. Arrange for inspections necessary to obtain Utility Company approval of installation.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.

- E. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Field Quality Control Test Reports.
- H. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Enclosure Keys: Two of each different key.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or

temporary power for permanent factory-installed space heaters.

- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within required service conditions during and after installation.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Switchboards - Basis of Design: Square D.
- B. Switchboards:
  - 1. Eaton Corporation
  - 2. Schneider Electric; Square D Products
  - 3. Siemens Industry, Inc
- C. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### **2.02 SWITCHBOARDS**

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Service Entrance Switchboards:
1. Listed and labeled as suitable for use as service equipment according to UL 869A.
  2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
  3. Comply with Utility Company requirements for electrical service.
- E. Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude: Less than 6,600 feet.
    - b. Ambient Temperature:
      - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
  2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- F. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
  2. Minimum Rating: 65,000 rms symmetrical amperes.
- G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- H. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
  2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding

- conductor.
- 4. Phase and Neutral Bus Material: Aluminum.
- 5. Ground Bus Material: Aluminum.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
  - 1. Line Conductor Terminations:
    - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Main and Neutral Lug Type: Mechanical.
  - 2. Load Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Lug Type:
      - 1) Provide mechanical lugs unless otherwise indicated.
- J. Enclosures:
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
    - b. Outdoor Locations: Type 3R.
  - 2. Finish: Manufacturer's standard unless otherwise indicated.
  - 3. Outdoor Enclosures:
    - a. Enclosure Type: Non-walk-in type unless otherwise indicated.
    - b. Color: Manufacturer's standard.
    - c. Access Doors: Lockable, with all locks keyed alike.
    - d. Walk-in Enclosure Features:
      - 1) Personnel Doors: Open to exterior; equipped with panic hardware.
      - 2) Aisle lighting, with switch at each access door.
- K. Future Provisions:
  - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list switchboards as a complete assembly including surge protective device.
- M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.



1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
  2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
    - a. Use zero sequence or residual ground fault detection method unless otherwise indicated.
    - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
- N. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.
- O. Owner Metering: Comply with Section 26 27 13.
- P. Instrument Transformers:
1. Comply with IEEE C57.13.
  2. Select suitable ratio, burden, and accuracy as required for connected devices.
  3. Current Transformers: Connect secondaries to shorting terminal blocks.
  4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

## **2.03 OVERCURRENT PROTECTIVE DEVICES**

- A. Circuit Breakers:
1. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  2. Molded Case Circuit Breakers:
    - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
      - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
    - b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous

- tripping element for short circuit protection.
- c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  - d. Provide the following features and accessories where indicated or where required to complete installation:
    - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
3. Insulated Case Circuit Breakers:
- a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
  - b. Operation:
    - 1) Provide manually operated circuit breakers unless otherwise indicated.
  - c. Construction:
    - 1) Provide fixed-mount circuit breakers unless otherwise indicated.
  - d. Trip Units: Solid state, microprocessor-based, true rms sensing.
  - e. Provide the following features and accessories where indicated or where required to complete installation:
    - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

## **2.04 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
  - 1. Dielectric tests.
  - 2. Mechanical operation tests.
  - 3. Grounding of instrument transformer cases test.
  - 4. Electrical operation and control wiring tests, including polarity and sequence tests.
  - 5. Ground-fault sensing equipment test.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.

- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- 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. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable circuit breaker tripping function settings as directed.
- L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- M. Provide filler plates to cover unused spaces in switchboards.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- D. Inspect and test in accordance with NETA ATS, except Section 4.
- E. Perform inspections and tests listed in NETA ATS, Section 7.1.
- F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than \_\_\_\_\_ amperes. Tests listed as optional are not required.
- G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
  - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- H. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- I. Test shunt trips to verify proper operation.
- J. Correct deficiencies and replace damaged or defective switchboards or associated components.

### 3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

### **3.05 CLEANING**

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

### **3.06 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

### **3.07 PROTECTION**

- A. Protect installed switchboards from subsequent construction operations.

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- G. Section 26 43 00 - Surge Protective Devices.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- E. NEMA PB 1 - Panelboards; 2011.

- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
- D. Manufacturer's equipment seismic qualification certification.
- E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Panelboard Keys: Two of each different key.



### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Eaton Corporation
- B. Schneider Electric; Square D Products BASIS OF DESIGN
- C. Siemens Industry, Inc

### **2.02 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.

- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
  2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

- c. Provide removable end walls for NEMA Type 1 enclosures.
  - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
3. Fronts:
- a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
  - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
  - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- N. Load centers are not acceptable.
- O. Provide the following features and accessories where indicated or where required to complete installation:
- 1. Feed-through lugs.
  - 2. Sub-feed lugs.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

**2.04 LIGHTING AND APPLIANCE PANELBOARDS**

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

**2.05 OVERCURRENT PROTECTIVE DEVICES**

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
  - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
  - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
  - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
  - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
  - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
  - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide the following features and accessories where indicated or where required to complete installation:
  - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
  - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## **2.06 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

- K. Provide grounding and bonding in accordance with Section 26 05 26.
- L. Install all field-installed branch devices, components, and accessories.
- M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.
- N. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Fire detection and alarm circuits.
- Q. Identify panelboards in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test AFCI circuit breakers to verify proper operation.
- G. Test shunt trips to verify proper operation.
- H. Correct deficiencies and replace damaged or defective panelboards or associated components.

**3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

**3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.



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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates.
- F. Floor box service fittings.
- G. Poke-through assemblies.
- H. Access floor boxes.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:  
Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 33.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.
- G. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

### 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; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed  
2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority  
Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including  
All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- N. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc.  
installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
  1. Wall Dimmers: Include derating information for ganged multiple devices.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Operation and Maintenance Data:
  1. Wall Dimmers: Include information on operation and setting of presets.
  2. GFCI Receptacles: Include information on status indicators.
- E. Project Record Documents: Record actual installed locations of wiring devices.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
  3. Extra Keys for Locking Switches: Two of each type.

### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

### **1.07 DELIVERY, STORAGE, AND PROTECTION**

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

## **PART 2 - PRODUCTS**

### **2.01 WIRING DEVICE APPLICATIONS**

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. For flush floor service fittings, use tile rings for installations in tile floors.

I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

### **2.02 WIRING DEVICE FINISHES**

A. Provide wiring device finishes as described below unless otherwise indicated.

- B. Wiring Devices, Unless Otherwise Indicated: Color to be selected by Architect from Manufacturer's list of standard colors.
- C. Wiring Devices Installed in Wet or Damp Locations: Color to be selected by Architect from Manufacturer's list of standard colors. with weatherproof cover.
- D. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.
- E. Flush Floor Box Service Fittings: Color as selected by Architect from Manufacturer's standard list of colors wiring devices with aluminum cover and ring/flange.
- F. Flush Poke-Through Service Fittings: Color as selected by Architect from Manufacturer's standard list of colors wiring devices with aluminum cover and aluminum flange.
- G. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

### **2.03 WALL SWITCHES**

- A. Manufacturers:
  - 1. Hubbell Incorporated
  - 2. Lutron
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- 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.

- D. Pilot Light Wall Switches: Commercial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

#### **2.04 WALL DIMMERS**

- A. Manufacturers:
  - 1. Hubbell Incorporated
  - 2. Lutron Electronics Company, Inc; Maestro Series
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.
- D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings.

#### **2.05 FAN SPEED CONTROLLERS**

- A. Manufacturers:
  - 1. Hubbell Incorporated
  - 2. Lutron Electronics Company, Inc; Maestro Series
  - 3. Pass & Seymour, a brand of Legrand North America, Inc
- B. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.

1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

## **2.06 RECEPTACLES**

### **A. Manufacturers:**

1. Hubbell Incorporated
2. Leviton Manufacturing Company, Inc

### **B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.**

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

### **C. Convenience Receptacles:**

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
3. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
4. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

### **D. GFCI Receptacles:**

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
  - a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.



3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
  4. Tamper Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
  5. Tamper Resistant and Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- E. USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
    - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
  2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
- F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

## **2.07 WALL PLATES**

- A. Manufacturers:
1. Hubbell Incorporated
  2. Leviton Manufacturing Company, Inc
  3. Lutron Electronics Company, Inc
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard.
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## **2.08 FLOOR BOX SERVICE FITTINGS**

- A. Manufacturers:
  - 1. Hubbell Incorporated
  - 2. Thomas & Betts Corporation
  - 3. Wiremold, a brand of Legrand North America, Inc
- B. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

## **2.09 POKE-THROUGH ASSEMBLIES**

- A. Manufacturers:
  - 1. Hubbell Incorporated
  - 2. Thomas & Betts Corporation
  - 3. Wiremold, a brand of Legrand North America, Inc
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

## **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 floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that openings in access floor are in proper locations.
- I. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Wall Dimmers: 48 inches above finished floor.
    - c. Fan Speed Controllers: 48 inches above finished floor.
    - d. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  4. Locate 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.
  5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches 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. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

- M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- N. 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.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- P. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. 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.

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**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Fuses.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 05 73 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.
- C. Section 26 24 13 - Switchboards: Fusible switches.
- D. Section 26 24 16 - Panelboards: Fusible switches.
- E. Section 26 25 13 - Low-Voltage Busways: Fusible switches.
- F. Section 26 28 16.16 - Enclosed Switches: Fusible switches.
- G. Section 26 29 13 - Enclosed Controllers: Fusible switches.

**1.03 REFERENCE STANDARDS**

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.



#### **1.04 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
  - a. Fusible Enclosed Switches: See Section 26 28 16.16.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Extra Fuses: One set(s) of three for each type and size installed.
  3. Fuse Pullers: One set(s) compatible with each type and size installed.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Bussmann, a division of Eaton Corporation
- B. Littelfuse, Inc:

#### **2.02 APPLICATIONS**

- A. Service Entrance:
  - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
  - 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- B. Feeders:
  - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
  - 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

### **2.03 FUSES**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class L Fuses: Comply with UL 248-10.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.



**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- 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.

- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

##### **A. Coordination:**

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Manufacturer's equipment seismic qualification certification.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Eaton Corporation
- B. Schneider Electric; Square D Products
- C. Siemens Industry, Inc
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### **2.02 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Minimum Ratings:
  - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
  - b. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
  1. Comply with NEMA KS 1.
  2. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
  - a. Provide means for locking handle in the ON position where indicated.
- P. Provide the following features and accessories where indicated or where required to complete installation:
  1. Hubs: As required for environment type; sized to accept conduits to be installed.
  2. Integral fuse pullers.

### **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 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.



- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- 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.

## **PART 2 PRODUCTS**

### **1.01 SUPPORT AND ATTACHMENT COMPONENTS**

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
  - a. TIA-569.
  - b. NFPA 70.
  - c. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Fire alarm system with voice evacuation design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Maintenance of fire alarm system under contract for specified warranty period.

### **1.02 RELATED REQUIREMENTS**

- A. Section 08 71 00 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
- B. Section 14 21 00 - Electric Traction Elevators: Elevator systems monitored and controlled by fire alarm system.
- C. Section 14 24 00 - Hydraulic Elevators: Elevator systems monitored and controlled by fire alarm system.
- D. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- E. Section 21 30 00 - Fire Pumps: Supervisory devices.
- F. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

### **1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
  - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
  - 3. Certification by Contractor that the system design will comply with Contract Documents.
  - 4. Proposed maintenance contract.
- C. Drawings must be prepared using Autocad or Revit..
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
  - 1. Copy (if any) of list of data required by authority having jurisdiction.
  - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
  4. System zone boundaries and interfaces to fire safety systems.
  5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
  6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
  7. List of all devices on each signaling line circuit, with spare capacity indicated.
  8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
  12. Certification by Contractor that the system design complies with Contract Documents.
- F. Evidence of installer qualifications.
- G. Evidence of instructor qualifications; training lesson plan outline.
- H. Evidence of maintenance contractor qualifications, if different from installer.
- I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
  2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test Form," filled out.
- J. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
  2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.

3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
  4. List of recommended spare parts, tools, and instruments for testing.
  5. Replacement parts list with current prices, and source of supply.
  6. Detailed troubleshooting guide and large scale input/output matrix.
  7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
  8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- K. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- L. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
  2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
  3. Certificate of Occupancy.
  4. Maintenance contract.
- M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
  2. In addition to the items in quantities indicated in PART 2, furnish the following:
    - a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
    - b. One copy, on CD-ROM, of all software not resident in read-only-memory.

- c. Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.

### **1.05 QUALITY ASSURANCE**

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
  - 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  - 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
  - 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
  - 4. Contract maintenance office located within 50 miles of project site.
  - 5. Certified in the State in which the Project is located as fire alarm installer.
- C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

### **1.06 WARRANTY**

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.



- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Fire Alarm Control Units and Accessories:
1. Honeywell Security & Fire Solutions/Notifier
  2. Siemens Building Technologies, Inc
  3. Simplex, a brand of Johnson Controls
  4. Provide control units made by the same manufacturer.
  5. Manufacturers owned by one of the companies listed above, but not directly listed will not be accepted.
- B. Initiating Devices and Notification Appliances:
1. Same manufacturer as control units.
  2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

### **2.02 FIRE ALARM SYSTEM**

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
  2. Protected Premises: Entire building shown on drawings.
  3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    - a. ADA Standards.
    - b. The requirements of the State Fire Marshal.
    - c. The requirements of the local authority having jurisdiction.
    - d. Applicable local codes.
    - e. Contract Documents (drawings and specifications).
    - f. NFPA 101.
    - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
  4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.

5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
  6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
  7. Program notification zones and voice messages as directed by Owner.
  8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
  9. Fire Command Center: Location indicated on drawings.
  10. Fire Alarm Control Unit: New, located at supervising station.
- B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
  2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at \_\_\_\_\_.
  3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
- C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
  2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
  3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
  2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
  3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
  2. Secondary: Storage batteries.
  3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
  4. Each Computer System: Provide uninterruptible power supply (UPS).

### **2.03 FIRE SAFETY SYSTEMS INTERFACES**

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
  2. Dry-pipe sprinkler system pressure.

3. Dry-pipe sprinkler valve room low temperature.
  4. Fire pump(s).
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
  2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
  3. Duct smoke detectors.
- C. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

## 2.04 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
  2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit: As specified for Basis of Design above, or equivalent.
- D. Remote Annunciators
- E. Initiating Devices:
1. Addressable Systems:
    - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
    - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
  2. Manual Pull Stations:
    - a. Provide 1 extra.
  3. Smoke Detectors:
    - a. Provide 1 extra.
  4. Heat Detectors:
    - a. Provide 1 extra.

- F. Notification Appliances:
  - 1. Horns:
    - a. Provide 1 extra.
  - 2. Strobes:
    - a. Provide 1 extra.
- G. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.
- H. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- I. Locks and Keys: Deliver keys to Owner.
- J. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
  - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
  - 2. Provide one for each control unit where operations are to be performed.
  - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  - 4. Provide extra copy with operation and maintenance data submittal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

#### **3.02 INSPECTION AND TESTING FOR COMPLETION**

- A. Notify Owner 7 days prior to beginning completion inspections and tests.

- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
  - 1. Record all system operations and malfunctions.
  - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
  - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
  - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

### **3.03 OWNER PERSONNEL INSTRUCTION**

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
  - 1. Initial Training: 1 session pre-closeout.

- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

### **3.04 CLOSEOUT**

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests.
  - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
  - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  - 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
  - 1. Specified diagnostic period without malfunction has been completed.
  - 2. Approved operating and maintenance data has been delivered.
  - 3. Spare parts, extra materials, and tools have been delivered.
  - 4. All aspects of operation have been demonstrated to Owner.
  - 5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
  - 6. Occupancy permit has been granted.
  - 7. Specified pre-closeout instruction is complete.

### **3.05 MAINTENANCE**

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

- B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
  - 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
  - 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:
  - 1. Provide on-site response within 2 hours of notification.
  - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  - 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- G. Comply with Owner's requirements for access to facility and security.