STROUD MANSION HERITAGE CENTER EXPANSION PROJECT

FOR

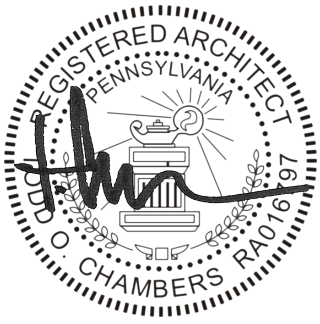
MONROE COUNTY HISTORICAL ASSOCIATION

900 Main Street
Stroudsburg, Pennsylvania 18360

MKSD Project No. 16.200

Architect
MKSD, LLC
1209 Hausman Road
Suite A
Allentown, PA 18104
Phone: (610) 366-2081
Fax: (610) 366-8399

MKSD architects



PROJECT MANUAL
MONROE COUNTY HISTORICAL ASSOCIATION
STROUD MANSION HERITAGE CENTER EXPANSION PROJECT
MKSD Project No. 16.200
Dated: January 26, 2023

MONROE COUNTY HISTORICAL ASSOCIATION

STROUD MANSION HERITAGE CENTER EXPANSION

TABLE OF CONTENTS

DIVISION 00 - BIDDING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

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GENERAL CONSTRUCTION

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AIA® Document A701™ – 2018

Instructions to Bidders

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

MCHA Stroud Mansion Renovations
900 Main Street
Stroudsburg, PA 18360

THE OWNER:
(Name, legal status, address, and other information)

Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18360

THE ARCHITECT:
(Name, legal status, address, and other information)

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

TABLE OF ARTICLES

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.

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidding documents are available at no cost via the PennBid Program (www.pennbid.net)
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

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

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

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall submit said inquiries via the "Clarifications" feature within PennBid no later than seven (7) days prior to the date for receipt of bids.

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

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

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

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

Addenda shall be transmitted via PennBid.

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted electronically via the PennBid Program (www.pennbid.net.), and shall include completion the electronic Bid Forms within PennBid, as well as uploading of all required supporting documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed.

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

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

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

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

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

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

§ 4.2 Bid Security

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

(Insert the form and amount of bid security.)

10%

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

be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

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

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

§ 4.3 Submission of Bids

§ 4.3.1 Bids, inclusive of bid security, and all documents required to be submitted with bids, shall be submitted electronically via the PennBid Program.

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

§ 4.3.2 (not used)

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

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

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

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Bids may be modified or withdrawn within PennBid at any time prior to the due date and time listed in the Invitation to Bid.

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

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

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

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

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

§ 5.2 Rejection of Bids

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

§ 5.3 Acceptance of Bid (Award)

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

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

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

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

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
(Paragraphs deleted)

.5 Drawings

Number	**Title**	**Date**

.6 Specifications

Section	**Title**	**Date**	**Pages**

.7 Addenda:

Number	**Date**	**Pages**

.8 Other Exhibits:

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

(Table deleted)(Paragraphs deleted)

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Additions and Deletions Report for
AIA® Document A701™ – 2018

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 16:41:03 ET on 01/25/2023.

PAGE 1

MCHA Stroud Mansion Renovations
900 Main Street
Stroudsburg, PA 18360

...

Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18360

...

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

PAGE 2

§ 3.1.1 ~~Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.~~Bidding documents are available at no cost via the PennBid Program (www.pennbid.net)

PAGE 3

§ 3.2.2 ~~Requests for~~ Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall~~be submitted by the Bidder in writing and shall be received by the Architect at least seven days~~ submit said inquiries via the "Clarifications" feature within PennBid no later than seven (7) days prior to the date for receipt of ~~Bids.~~ bids.

PAGE 4

Addenda shall be transmitted via PennBid.

...

§ 4.1.1 Bids shall be submitted ~~on the forms included with or identified in the Bidding Documents.~~electronically via the PennBid Program (www.pennbid.net.), and shall include completion the electronic Bid Forms within PennBid, as well as uploading of all required supporting documents.

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

...

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PAGE 5

§ 4.3.1 ~~A Bidder shall submit its Bid as indicated below:~~Bids, inclusive of bid security, and all documents required to be submitted with bids, shall be submitted electronically via the PennBid Program.

...

§ 4.3.2 ~~Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.~~(not used)

...

§ 4.4.1 ~~Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original~~ Bids may be modified or withdrawn within PennBid at any time prior to the due date and time listed in the Invitation to Bid.
PAGE 7

.1 AIA Document ~~A101™–2017,~~ A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, unless otherwise stated below.

...

~~**.2** AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)~~

.3 AIA Document ~~A201™–2017,~~ A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, unless otherwise stated below.

...

~~**.4** AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)~~
PAGE 8

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

~~[–] The Sustainability Plan:~~

~~**Title** **Date** **Pages**~~

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd O. Chambers, AIA, 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 16:41:03 ET on 01/25/2023 under Order No. 2114397647 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 0120 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders.", a copy of which is bound in this Project Manual.
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 ARTICLE 1 - DEFINITIONS

A. Delete paragraph 1.2 in its entirety and, in lieu thereof, substitute the following new paragraph:

1.2 [*Substitute:*] All definitions set forth in the General Conditions and Supplementary General Conditions of the Contract or in other contract Documents are applicable to the Bidding Documents.

1.4 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.5:

2.1.5 - The Bidder is a properly licensed Contractor according to the laws and regulations of Stroudsburg Borough, Monroe County, Pennsylvania and meets qualifications indicated in the Procurement and Contracting Documents. The Bidder is required to examine carefully in detail the character of the Site of the Project, the Contract Documents and all other matters pertinent to the work contemplated. It will be assumed that they have satisfied themselves as to the conditions to be encountered overhead, on the surface and concealed, the character quality and quantities of work to be done and materials to be furnished,

and the requirements of the Contract Documents and Specifications. No allowance or concession will be made for the lack of such information. Where underground and overhead structure locations are shown, they are for the information of the Architect only; their correctness is not guaranteed by the Owner, or the Architect, and in no event is this information to be considered a part of the Contract, or to be used for computations in submitting a proposal. If this information is used by a Bidder in preparing their Bid, they must assume all risks resulting from conditions differing from the approximate shown. If bidders desire to obtain such data, the Owner will, to the extent possible afford them the opportunity, at Bidder's own expense to make borings or soundings, to drive test piles, to dig test pits on the site of the work, and to make measurements and studies of all kinds; where Owner cannot grant such rights, it will cooperate with Bidder in endeavoring to secure such rights.

There is no expressed or implied agreement that the existing conditions have been correctly indicated and Bidders shall take into account and assume the risk that conditions affecting the cost or quantities of work to be done may differ from those indicated.

Each Bidder shall carefully examine all Bidding Documents and materials pertinent thereto, with respect to all the categories of work for which the Owner had advertised and will receive proposal, so that each bidder be completely aware and satisfied as to the character, quality and quantities of all work, materials, equipment, products, and services required and to be provided by them to perform and complete all work of their Contract and the work of such other Contractors so employed by the Owner in the project.

Should work to be performed be specified or indicated in more than one Prime Contract and no clarifications received by Addendum prior to Bid date, each Prime Contract Bidder so affected who is submitting a Bid shall consider the work to be part of their Prime Contract. A subsequent determination will be made and an amount commensurate to the work to be performed will be deducted from the Contractor determined not to be responsible.

Each Bidder by submission of their proposal represents that they have visited the site, that they have read the bidding Documents and understands their full character and intent, that they otherwise complied with the provisions of Article 3, and should the Owner subsequently accept their proposal, no claims, allowances or concessions will be made, accepted or recognized by the Owner at any future time for any additional labor, equipment or materials require, or for any difficulties encountered in the work, or for the lack of any information which could have been foreseen, apparent or ascertained had the Bidder so complied with Article 3.

Bidder shall ascertain all governmental and utility requirements with respect to wage scales, materials, equipment, products, labor, safety and sanitation and shall base his bid prices on full compliance therewith.

The Bidder has familiarized themselves with labor conditions which might affect or influence the performance of the Work.

C. Add Section 2.1.6:

1. 2.1.6 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.5 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation using form furnished with electronic bid forms and submitted via email.

B. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:

a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.

2. Add Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.6 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from Architect.

2. Add Section 4.1.8:

a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

3. Add Section 4.1.9:

a. 4.1.9 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

4. Add Section 4.1.10:

a. 4.1.10 **-** Bids shall include sales and use taxes, unless specifically exempted. Contractors shall show separately with each monthly payment application the sales and use taxes paid by them and their subcontractors in the form indicated. Reimbursement of sales and use taxes, if any, shall be applied for by Owner for the sole benefit of Owner.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

b. 4.4.2.2 - Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Add Section 4.5:

a. 4.5 - Provide detailed cost breakdowns no later than two business days following Architect's request.

E. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

1. Add Section 4.6:

    a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products no later than two business days following Architect's request. Include those subcontractors, suppliers, and manufacturers providing work totaling ten percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.7 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

    a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.8 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

    a. 6.1.1 - Submit Contractor's Qualification Statement with bid submission.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

    a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than two business days following Clerk of the Works or Architect's request.

1.9 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

    a. 7.1.1.1 - Both a Performance Bond and a Payment Bond may be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:

    a. The Bidder shall deliver the required bonds, if requested, to Owner no later than 10 days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.

2. Delete Section 7.2.3 and insert the following:

    a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.10 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Clerk of the Works or Architect, in such number of counterparts as Owner may require.
2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement.
4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

END OF DOCUMENT 00 2213

DOCUMENT 00 0115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

General

G001	Cover Sheet
G002	Life Safety – Code Analysis
G003	Life Safety Plans

Civil

C101	Cover Sheet
C102	Notes Sheet
C201	Existing Conditions/Demolition Plan
C301	Site Plan
C401	Grading Plan
C501	Utility Plan
C601	Soil Erosion and Sedimentation Pollution Control Plan
C602	Soil Erosion and Sedimentation Pollution Control Notes
C603	Soil Erosion and Sedimentation Pollution Control Details
C701	Landscape Plan
C702	Landscape Details
C801	Profiles
C802	Profiles
C901	Details

Structural

S100	Foundation Plan
S101	First Floor Framing Plan
S102	Second Floor Framing Plan
S103	Third Floor Framing Plan
S104	Roof Framing Plan
S200	General Notes & Schedules
S300	Typical Foundation Details
S301	Foundation Sections
S400	Typical Framing Details
S401	Framing Sections

Architectural

D100	Architectural Building Demolition Plan – Level 00 & 01
D101	Architectural Building Demolition Plan – Level 02 & 03

A001	Architectural Site Plan
A010	Partition Types, Abbreviations, Symbols
A100	Basement Construction Plan
A101	First Floor Construction Plan
A102	Second Floor Construction Plan
A103	Third Floor Construction Plan
A104	Roof Construction Plan
A201	Building Elevations
A202	Building Elevations
A301	Building Sections
A302	Building Sections
A303	Building Sections
A311	Wall Sections
A312	Wall Sections
A313	Wall Sections
A321	Section Details
A322	Section Details
A323	Typical Roof Details
A331	Enlarged Stair Plans and Sections
A332	Stair Details
A400	Basement Reflected Ceiling Plan
A401	First Floor Reflected Ceiling Plan
A402	Second Floor Reflected Ceiling Plan
A403	Third Floor Reflected Ceiling Plan
A500	Basement Finish Plans and Details
A501	First Floor Finish Plan
A502	Second Floor Finish Plan
A503	Third Floor Finish Plan
A600	Door Schedule and Details
A601	Curtain Wall Elevations, Window Elevations, Vision Panel Elevations
A701	Interior Elevations
A702	Interior Elevations
A703	Interior Elevations
A710	Enlarged Toilet Room Plans and Elevations
A711	Interior Details

Mechanical

M001	General Notes & Symbols List
M050	Basement & First Floor Plans – Mechanical Demolition
M051	Second & Third Floor Plans – Mechanical Demolition
M100	Basement Plan – Mechanical
M101	First Floor Plan – Mechanical
M102	Second Floor Plan – Mechanical
M103	Third Floor Plan – Mechanical
M104	Roof Plan – Mechanical
M105	Basement Plan – Mechanical Piping
M106	First Floor Plan – Mechanical Piping
M107	Second Floor Plan – Mechanical Piping
M108	Third Floor Plan – Mechanical Piping

M109	Roof Plan – Mechanical Piping
M500	Details
M501	Details
M600	Schedules

Plumbing

P001	General Notes & Symbol List
P050	Basement & First Floor Plans – Domestic Water/Gas Demolition
P051	Second Floor Plan – Domestic Water/Gas Demolition
P100	Basement Plan – Domestic Water/Gas
P101	First Floor Plan – Domestic Water/Gas
P102	Second Floor Plan – Domestic Water/Gas
P103	Third Floor Plan – Domestic Water/Gas
P200	Basement Plan – Sanitary/Vent
P201	First Floor Plan – Sanitary/Vent
P202	Second Floor Plan – Sanitary/Vent
P203	Third Floor Plan – Sanitary/Vent
P204	Roof Plan – Sanitary/Vent
P500	Details
P501	Details
P600	Schedules

Electrical

E001	General Notes & Symbols List
E050	Basement and First Floor Plans – Power Demolition
E051	Second and Third Floor Plans – Power Demolition
E052	Basement and First Floor Plans – Lighting Demolition
E053	Second and Third Floor Plans – Lighting Demolition
E100	Basement Plan – Power
E101	First Floor Plan – Power
E102	Second Floor Plan – Power
E103	Third Floor Plan – Power
E104	Roof Plan – Power
E200	Basement Plan – Lighting
E201	First Floor Plan – Lighting
E202	Second Floor Plan – Lighting
E203	Third Floor Plan – Lighting
E500	Details
E501	Details
E600	Schedules

END OF SECTION 00 0115

ADVERTISEMENT FOR BIDS

Notice is hereby given that Monroe County Historical Association, 900 Main Street, Stroudsburg, PA 18360, will receive bids electronically via PennBid for the **Alterations & Heritage Center Addition** project consisting of interior alterations to the existing Stroud Mansion, new building addition and related sitework.

Bid Due Date: **1:00 p.m., prevailing Eastern time, February 23, 2023**,

Bidders may obtain bidding documents at no cost on PennBid (https://pennbid.procureware.com) To be recognized as a valid bidder, bid documents for this project (including any specifications and drawings) must be procured and downloaded from PennBid. Due to the possibility of inaccuracies in documents procured from other sources and the potential for an incomplete understanding of the project scope, bids submitted by firms who procure these documents from any other source other than the authorized source will be considered non-responsive and will be rejected.

Bids must be received via PennBid (https://pennbid.procureware.com) before the hour and date specified above, at which time, all bids received will be publicly opened results displayed publicly on PennBid.

Bids must be accompanied by a certified check, or a bid bond, with a corporate surety authorized to do business in Pennsylvania in accordance with the project specifications in the amount of 10% of the total bid amount. A Performance Bond and Payment Bond in the amount of 100% of the contract shall be furnished by the successful bidder as detailed in the Instructions to Bidders. Prevailing Wage Rates apply.

A mandatory pre-bid meeting will be conducted on February 2, 2023 at 10:00 AM. Attendees of the pre-bid meeting shall meet at Stroud Mansion's meeting room located at 900 Main Street, Stroudsburg, PA 18360. Questions may be submitted, in writing, via the "Clarifications" feature in PennBid. Responses will be provided to all registered bidders via addendum.

The Monroe County Historical Association reserves the right to accept or reject any or all bids or portions or to waive any informalities in bidding and to withhold award for a period of sixty days.

Monroe County Historical Association:
Amy Leiser, Executive Director

DATE OF ADVERTISEMENT: January 20 & 23, 2023

AIA® Document A305™ – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)
Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18306

SUBMITTED TO:
(Organization name and address.)

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

[ ] Exhibit A – General Information
[ ] Exhibit B – Financial and Performance Information
[ ] Exhibit C – Project-Specific Information
[ ] Exhibit D – Past Project Experience
[ ] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

Organization's Authorized Representative Signature _____ **Date** _____

Printed Name and Title _____

NOTARY
State of:
County of:
Signed and sworn to before me this day of

Notary Signature _____

My commission expires:

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.

Additions and Deletions Report for

AIA® Document A305™ – 2020

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 17:00:24 ET on 12/21/2022.

PAGE 1

Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18306

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd Chambers, AIA, 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 17:00:24 ET on 12/21/2022 under Order No. 6263448050 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A305™ – 2020, Contractor's Qualification Statement, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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SECTION 00 1400 - AGREEMENT OF SURETY

(Note: This Agreement must be properly executed and must accompany the Certified Check, Bank Cashier's Check, Trust Company Treasurer's Check or Bid Bond, whichever is furnished as Bid Security.)

KNOW ALL MEN BY THESE PRESENTS, that we _____

_____, as Surety, a corporation existing under the laws of

the State of _____, and authorized to transact business in the

Commonwealth of Pennsylvania, hereby agree to execute within the time limit specified in the Contract

Documents, the Contract Bonds in the forms and in the amounts required for the faithful performance

and proper fulfillment of the Contract for_____

_____

on behalf of _____

_____

hereinafter called the Bidder, provided that the above Contract be awarded to the Bidder within ninty (90) days after the date of opening of bids or otherwise as set forth in the Instructions to Bidders; and the Surety further agrees that should the Surety after notification of intent to make such award omit or refuse to execute the required bonds, then the Surety shall pay to Monroe County Historical Association, 900 Main Street, Stroudsburg, PA 18360, the amount of the Bid Security.

_____ _____

WITNESS CORPORATE SURETY

_____ _____ (Affix Corporate Seal)

DATE SIGNATURE

_____

ATTORNEY-IN-FACT

END OF SECTION 00 1400

SECTION 00 2513 - PREBID MEETING

1.1 PREBID MEETING

A. Construction Manager will conduct a Prebid meeting as indicated below:

1. Meeting Date:
   a. Prebid and Walk-thru: Thursday, February 2, 2023 at 10:00 a.m., local time.
2. Location: Stroud Mansion's Meeting Room, located at 900 Main Street, Stroudsburg, PA 18360.

B. Attendance:

1. Prime Bidders: Attendance at Prebid meeting is mandatory.

C. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including, but not limited to the following:

1. Procurement and Contracting Requirements:

   a. Advertisement for Bids.
   b. Instructions to Bidders.
   c. Bidder Qualifications.
   d. Bonding.
   e. Insurance.
   f. Bid Security.
   g. Bid Form and Attachments.
   h. Bid Submittal Requirements.
   i. Bid Submittal Checklist.
   j. Notice of Award.

2. Communication during Bidding Period:

   a. Obtaining documents.
   b. Access to Project Web site.
   c. Bidder's Requests for Information.
   d. Bidder's Substitution Request/Prior Approval Request.
   e. Addenda.

3. Contracting Requirements:

   a. Agreement.
   b. The General Conditions.
   c. The Supplementary Conditions.
   d. Other Owner requirements.

4. Construction Documents:

a. Scopes of Work.
b. Temporary Facilities.
c. Use of Site.
d. Work Restrictions.
e. Alternates, Allowances, and Unit Prices.
f. Substitutions following award.

5. Separate Contracts:

a. Work by Owner.
b. Work of Other Contracts.

6. Schedule:

a. Project Schedule.
b. Contract Time.
c. Liquidated Damages.
d. Other Bidder Questions.

7. Site/facility walkthrough.
8. Post-Meeting Addendum.

D. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF SECTION 00 2513

SECTION 00 2600 - PROCUREMENT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Division 01 2600 “Contract Modification Procedures” for conditions under which Substitution requests will be considered following Contract award.

1.3 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.4 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.5 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
2. Submittal Format: Submit electronically each written Procurement Substitution Request, using form bound in Project Manual.
3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

    a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
    b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

        1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
        2) Copies of current, independent third-party test data of salient product or system characteristics.
        3) Samples where applicable or when requested by Architect.
        4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
        5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
        6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
        7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

    c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
    d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all

bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 00 2600

DOCUMENT 00 3126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. An existing asbestos report for Project, prepared by IAQS, dated November 26, 2022, is available for viewing as appended to this Document.

C. Contractor shall provide abatement services for all known hazardous materials identified in the following report.

D. Related Requirements:

1. Document 00 2113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Section 02 4119 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT 00 3126

ADVANCED IAQ SOLUTIONS, INC.
A DEFINITIVE APPROACH TO INDOOR AIR QUALITY

MCHS
900 W. Main ST.
Stroudsburg, Pa. 18350
11/26/22
re: Stroud Mansion

Executive Summary

Asbestos Inspection and Sampling Report

Site Information:

This historic building is comprised of two sections that were built in different centuries. The oldest section was built in approximately 1795 and is referred to as the Mansion. The attached structure was built on or around 1893 and is referred to as the 1893 Addition. In 1993 there were major renovations performed in both sections. The roof of the 1893 addition was reported to be replaced with new material in the winter of 2015-16. There have been multiple cosmetic repairs and updating inside these two sections over the years and there is no known record of that. The 1893 Addition is slated to be demolished making room for a new, larger facility.

Services Provided:

Keith Roe, Pa. Asbestos Inspector # 042077 was contacted by Ken Sandri originally to perform an inspection primarily in the 1893 building for the presence of ACM (asbestos containing materials). This was expanded to include those sections of the attached mansion that would be entered during the 1893 demolition as well as areas where there were construction or mechanical system updates are planned in the near future.

This project is classified as a NESHAP (National Emission Standards for Hazardous Air Pollutants) Project - EPA Regulation 40 CFR subpart M, Part 6 and subject to all practices and standards therein.

Bulk material samples were taken consistent with guidelines to prevent any fiber emissions during the sample taking process. Water or shave cream was applied to the areas prior to disturbing the surface and each sample area was identified by a sample number that corresponded to the Chain of Command used. Each sample was sealed and sent to EHS (Environmental Hazards Services, LLC) for PLM (polarized light microscopy) analysis. PLM is an optical microscopy technique for analyzing bulk samples for asbestos in which the sample is illuminized with polarized light (light that vibrates in only one place) to distinguish between different types of asbestos fibers by their shape and unique properties.

Sampling Details

A total of 27 bulk samples were taken of SACM (suspect asbestos containing materials) targeting those areas where repairs, updated finish coatings, added insulation or other materials may have been used that could contain asbestos fibers. Asbestos was commonly used from the early 1940's to late 1970's as a highly effective fire retardant, thermal and acoustic material.

Advanced IAQ Solutions Inc.
Pa. Asbestos Inspector # 042077
Keith Roe CMC,CIE
keith.roe@rcn.com
www.advancediaqconsulting.com
610 972 1293

Plaster and drywall finishes were identified as homogeneous materials and sampled on each floor to ensure without destructive sampling techniques, that variation in the type and age of materials was unlikely.

Reference: Sampling Legends 11/10/22 and 11/22/22 attached

FINDINGS:

ACM (asbestos containing material) is defined as any material that contains more than 1% asbestos fiber (AHERA, OSHA definition).

The following materials were reported as RACM (regulated asbestos materials) by EHS after 23 PLM analyses were performed of all known SACM (suspect asbestos containing materials) in the effected or designated areas.

Reference: EHS report # 22-11-02055 and #22-11-03884

Sample A- Mansion- boiler room ceiling spackle and tape- 2% chrysotile- **approx. 202.5 sq.ft**.

Sample B- Mansion -boiler room - flue mastic- 2nd layer – 40% chrysotile- **approx. 3 sq.ft**.

Sample H- 1893 building- 2nd floor bathroom VAT (vinyl asbestos tile) – 3% chrysotile- **approx. 200 sq.ft.**

Sample I- 1893 building- 2nd floor VAT mastic - < 1% chrysotile, composite material- **approx. 200 sq.ft.**

Critical Action Plan:

The RACM materials must be removed prior to demolition using negative air containment work areas In accordance with all applicable OSHA and EPA standards and regulations as stated.

Additional Recommendations:

The Mansion boiler room that contains the ACM spackle and non-ACM drywall in poor condition, should be removed as a total composite at the same time the flue pipe mastic is removed and replaced. The mastic on the bathroom floor may remain after the VAT is removed.

Regulations and Standards:

This project is subject to NESHAP regulations and standard: EPA-Regulation 40 CFR subpart M- part 6. OSHA 29 CFR 1910.134- Use of Respirators, OSHA 29 CFR 1910.1001, 29 CFR 1926.1101, EPA waste Management Guidance – EPA/530-SW-85-007.

(see attached Asbestos Laws and Regulations US- EPA)

Contractor Requirements:

* A Pa. licensed, accredited and insured Asbestos Abatement contractor is required to perform the notification, removal and waste manifesting and disposal services.
* A 10-day notification period to the PA DEP is required prior to removal. Currently a $300.permit cost is assessed when notice is filed by the contractor.
* The quotation should be itemized to show costs for compliance to each step of compliance to stated standards and regulations.

Project Validation Services

Upon completion of the abatement services and prior to the removal of the containment areas, A NIOSH 7400 1200 liter air sample must be taken in each containment area and analyzed using PCM (Phase Contrast Microscopy) analysis to ensure that no elevated fibers are present in the abated areas in the mansion

Advanced IAQ Solutions, Inc
630 trach Rd., Bath Pa. 18014
610.972.1293

ACM SAMPLING LEGEND

630 Trach Rd.
Bath, PA 18014

PROJECT NAME: MCHS Stroud Mansion **COLLECTION DATE:** 11-10-22

900 W. Main St., Stroudsburg, Pa 18360

LOCATION	SAMPLE ID	QTY	HOMOGENEOUS	CONDITION	ANALYSIS	COMMENT
Mansion (1795)	A spackle	1	No	poor	PLM	butler room drywall ceiling
mansion	B	1	No	damaged	PLM	flue pipe mastic - 2nd layer
mansion	C	1	yes	damaged	PLM	1st brown coat on foundation
mansion	D	1	yes	damaged	PLM	2nd layer foundation wall
1893 bldg.	E	1	yes	good	PLM	2nd floor stairwell - wall plaster
1893 bldg	F	1	yes	good	PLM	2nd floor - weapons room - wall plaster
mansion	G	1	no	poor	PLM	attic chimney coating
1893	H	1	no	good	PLM	bathroom VAT tile
1893	I	1	no	good	PLM	VAT tile mastic - bathroom
1893	J	1	yes	good	PLM	1st floor - 1st layer plaster
1893	K	1	yes	good	PLM	1st floor - 2nd layer plaster
1893	L	1	no	good	PLM	2nd floor drywall + spackle
1893	K1	1	yes	good	PLM	2nd floor plaster + coating
1893	L2	1	yes	good	PLM	2nd floor ceiling plaster + coat

14 samples

ENVIRONMENTAL HAZARDS SERVICES, LLC

Asbestos Chain of Custody Form

Pg ____ of ____

Company Name / Company Address	IAQS ADVANCED IAQ SOLUTIONS, INC. — 630 Trach Rd. Bath, PA 18014	Account # / City/State/Zip	20165
Phone	Keith.roe@rcn.com 610-972-1293	Email	Keith.roe@rcn.com
Project Name/Test Address	Stroud Mansion 900 W main st. Stroudsburg		
PO Number		Collected By	Keith Roe #042077
Turn Around Time	☐ 3 DAY ☐ 2 DAY ☐ 1 DAY ● SAME DAY OR WEEKEND - Must Call Ahead		

☐ PLM New York Protocol ☐ PLM New Jersey Protocol ☐ PLM South Carolina Protocol

LAB NUMBER	Client Sample ID	Homogeneous Area	Positive Stop	Collection Date & Time	BULK: PLM	BULK: Point Count 400	BULK: Point Count 1000	BULK: TEM Bulk	AIR: PCM	AIR: TEM AHERA	AIR: NIOSH 7402	AIR: Time In Total Minutes	AIR: Flow Rate in L/Min	AIR: Volume in Total Liters	COMMENTS
1	A Spackle			11/10/22	✓										base for ceiling basement spackle
2	B				✓										Chimney flue mastic
3	C D			10 AM	✓										foundation basement brown coat
4	E				✓										(2nd fl.) stairwell wall repair
5	F				✓										3rd fl. Bushkill Falls W.P.
6	G				✓										attic Chimney coating
7	H I			11 AM	✓										2nd fl floor tile & mastic - VAT
8	J K	X			✓										1893 1st floor plaster + coating
9	L														Spackle drywall - near bathroom
10	K1	X													2nd floor plaster + coating
11	L2	X													3rd floor plaster
12	(14) Samples														
13															
14															
15															

Released By: K Roe Date: 11/10/22 Time: PM

Signature: Keith Roe Pa #042077

LAB USE ONLY – BELOW THIS LINE

Received By: TStone

Signature: [signature]

Date: 11/11/22 Time: 12:11 27 ☒ AM ☐ PM

☐ Portal Contact Added

7469 WHITEPINE RD, RICHMOND, VA 23237 (800)-347-4010

RESULTS VIA CLIENT PORTAL AVAILABLE @ www.leadlab.com

22-11-02055

Due Date: 11/11/2022 (Friday) AE

14 PLM

EHS Laboratories

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237

Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 22-11-02055

Client: Advanced IAQ Solutions
630 Trach Rd
Bath, PA 18014

Received Date: 11/11/2022
Analyzed Date: 11/11/2022
Reported Date: 11/11/2022

Project/Test Address: Stroud Mansion; 900 W. Main St.; Stroudsburg

Client Number:
201615

Fax Number:

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-02055-001	A		Gray Paint-Like; White Powdery; Brown Fibrous; Inhomogenous	2% Chrysotile	20% Cellulose 78% Non-Fibrous
			Total Asbestos: 2%		
Chrysotile present throughout.					
22-11-02055-002	B		Gray Fibrous; Homogenous	40% Chrysotile	60% Non-Fibrous
			Total Asbestos: 40%		
22-11-02055-003	C		Beige Brittle; Homogenous	NAD	100% Non-Fibrous
22-11-02055-004	D		Gray Cementitious; Homogenous	NAD	100% Non-Fibrous
22-11-02055-005	E		Beige Paint-Like; Beige Powdery; Inhomogenous	NAD	100% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201615 **Report Number:** 22-11-02055

Project/Test Address: Stroud Mansion; 900 W. Main St.; Stroudsburg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-02055-006	F		Gray Paint-Like; Beige Powdery; Brown Fibrous; Gray Granular; Inhomogenous	NAD	15% Cellulose 85% Non-Fibrous
22-11-02055-007	G		Gray Cementitious; Homogenous	NAD	100% Non-Fibrous
22-11-02055-008	H		Blue Vinyl; Homogenous	3% Chrysotile	97% Non-Fibrous
			Total Asbestos: 3%		
22-11-02055-009	I		Black Adhesive; Homogenous	Trace <1% Chrysotile	100% Non-Fibrous
			Total Asbestos: Trace <1%		
Possible contamination from floor tile.					
22-11-02055-010	J		White Brittle; Homogenous	NAD	100% Non-Fibrous
22-11-02055-011	K		Gray Cementitious; Homogenous	NAD	100% Non-Fibrous
22-11-02055-012	L		Beige Paint-Like; White Powdery; Inhomogenous	NAD	100% Non-Fibrous
22-11-02055-013	K1		White Brittle; Gray Cementitious; Inhomogenous	NAD	2% Hair 98% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201615 **Report Number:** 22-11-02055

Project/Test Address: Stroud Mansion; 900 W. Main St.; Stroudsburg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-02055-014	L2		Beige Paint-Like; White Granular; Inhomogenous	NAD	100% Non-Fibrous

QC Sample: 53-M22020-4

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Angel McDaniel

Reviewed By Authorized Signatory: Tasha Eaddy

Tasha Eaddy
QA/QC Clerk

These results are based on a comparative visual estimate. The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproducec except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

ACM SAMPLING LEGEND

630 Trach Rd.
Bath, PA 18014

PROJECT NAME: MCHS Stroud Mansion **COLLECTION DATE:** 11-22-22

900 W. main St., Stroudsburg Pa 18360

LOCATION	SAMPLE ID	QTY	HOMOGENEOUS	CONDITION	ANALYSIS	COMMENT
mansion	M	1	yes	poor	PLM	boiler room 5/8" drywall
mansion	N	1	yes	poor	PLM	boiler room 3/8" drywall
mansion	O	1	yes	good	PLM	library room ceiling
mansion	P	1	yes	good	PLM	library room wall
1893	Q	1	yes	good	PLM	west rm 1st floor ceiling
1893	R	1	yes	friable	PLM	coarse, brown blown in insulation below floor boards in attic (east)
1893	S	1	yes	friable	PLM	
1893	T	1	yes	friable	PLM	
mansion	U	1	yes	good	PLM	east clothing room wall
mansion	V	1	yes	good	PLM	east clothing room ceiling
mansion	W	1	yes	friable	PLM	coarse blown insulation
mansion	X	1	yes	friable	PLM	west attic, below floor
mansion	Y	1	yes	friable	PLM	boards

13 samples

ENVIRONMENTAL HAZARDS SERVICES, LLC

Asbestos Chain of Custody Form

Pg 1 of 1

Company Name	ADVANCED IAQ SOLUTIONS, INC.	Account #	2016
Company Address		City/State/Zip	
Phone	Keith.roe@rcn.com 610-972-1293	Email	Keith.roe@rcn.com
Project Name/Test Address	MCHA - Stroud Mansion 900 W main st, Stroudsburg Pa		
PO Number		Collected By	K Roe #042077 PA.

Turn-Around Time: ○ 3 DAY ○ 2 DAY ○ 1 DAY ● SAME DAY OR WEEKEND - Must Call Ahead

☐ PLM New York Protocol ☐ PLM New Jersey Protocol ☐ PLM South Carolina Protocol

LAB NUMBER	Client Sample ID	Homogeneous Area	Positive Stop	Collection Date & Time	BULK: PLM	BULK: Point Count 400	BULK: Point Count 1000	BULK: TEM Bulk	AIR: PCM	AIR: TEM AHERA	AIR: NIOSH 7402	AIR: Time In Total Minutes	AIR: Flow Rate In L/Min	AIR: Volume In Total Liters	COMMENTS
1	M			11-22-22 7-8Am	✓										drywall 1 - 5/8" boiler rm ceiling
2	N				✓										boiler rm ceiling 2 - 3/8"
3	O				✓										mansion library rm ceeling
4	P				✓										library rm wall
5	Q				✓										W. room 1st floor ceeling
6	R	✓			✓										1893 attic floor insulation
7	S	✓			✓										1893 attic floor insulation
8	T	✓			✓										1893 attic floor insulation
9	U				✓										mansion east clothing - wall
10	V				✓										mansion east clothing - ceiling
11	W	✓			✓										mansion w. attic floor insulation
12	X	✓			✓										mansion w. attic floor insulation
13	Y	✓			✓										mansion w. attic floor insulation
14															
15															

Released By: K. Roe Date: 11-22-22 Time: PM

Signature: Keith Roe

LAB USE ONLY – BELOW THIS LINE

Received By: A. Walker

Signature: A Walker

Date: 11/23/22 Time: 11:03 ☒ AM ☐ PM

22-11-03884

Due Date: 11/23/2022 (Wednesday) AE

KEK

☐ Portal Contact Added

13 PLM

7469 WHITEPINE RD, RICHMOND, VA 23237 (800)-347-4010

RESULTS VIA CLIENT PORTAL AVAILABLE @ www.leadlab.com

Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 22-11-03884

Client: Advanced IAQ Solutions
630 Trach Rd
Bath, PA 18014

Received Date: 11/23/2022
Analyzed Date: 11/23/2022
Reported Date: 11/23/2022

Project/Test Address: MCHA-Stroud Mansion; 900 W Main St; Stroudsburg, PA

Client Number: 201615

Fax Number:

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-03884-001	M	--	Brown Fibrous; White Chalky; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
22-11-03884-002	N	--	Brown Fibrous; White Chalky; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
22-11-03884-003	O	--	White/Beige/Silver Paint-Like; White Powdery; Inhomogeneous	NAD	100% Non-Fibrous
22-11-03884-004	P	--	White/Beige/Silver Paint-Like; White Powdery; Inhomogeneous	NAD	100% Non-Fibrous
22-11-03884-005	Q	--	White Powdery; Off-White Fibrous; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201615 **Report Number:** 22-11-03884

Project/Test Address: MCHA-Stroud Mansion; 900 W Main St; Stroudsburg, PA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-03884-006	R	--	Brown Fibrous; Homogeneous	NAD	99% Cellulose 1% Non-Fibrous
22-11-03884-007	S	--	Brown Brittle; Black Fibrous; Inhomogeneous	NAD	35% Cellulose 10% Fibrous Glass 2% Synthetic 15% Hair 38% Non-Fibrous
22-11-03884-008	T	--	Brown Fibrous; Homogeneous	NAD	99% Cellulose 1% Non-Fibrous
22-11-03884-009	U	--	White/Beige Paint-Like; White Powdery; Inhomogeneous	NAD	100% Non-Fibrous
22-11-03884-010	V	--	White/Beige Paint-Like; White Brittle; Gray Granular; Inhomogeneous	NAD	2% Hair 98% Non-Fibrous
22-11-03884-011	W	--	Brown Fibrous; Homogeneous	NAD	99% Cellulose 1% Non-Fibrous
22-11-03884-012	X	--	Brown Fibrous; Homogeneous	NAD	85% Cellulose 10% Hair 5% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201615 **Report Number:** 22-11-03884

Project/Test Address: MCHA-Stroud Mansion; 900 W Main St; Stroudsburg, PA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
22-11-03884-013	Y	--	Brown Fibrous; Homogeneous	NAD	99% Cellulose 1% Non-Fibrous

QC Sample: 52-M12010-4

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Keleigh King

Reviewed By Authorized Signatory: Howard D. Varner

Howard Varner
General Manager

These results are based on a comparative visual estimate. The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproducec except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

SECTION 00 4010 - NON-COLLUSION AFFIDAVIT OF CONTRACTOR

State of _____,

County of _____.

(Name) _____ being first duly sworn, states that:

(1) He is _____ (owner, partner, office, representative agent)

of _____ (Company),

the bidder that has submitted that attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has, in any way, colluded, conspired, connived, or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person, to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit, or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against Monroe County Historical Association or any person interested in the proposed Contract; and,

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

_____

_____ Title

Subscribed and sworn to before me this _____ day of _____, 20___.

By: _____

TITLE: _____

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SECTION 00 4011 – NON-DISCRIMINATION CLAUSE

_____, hereinafter referred to as the CONTRACTOR, agrees as follows:

1. CONTRACTOR shall not discriminate against any employee, applicant for employment, independent contractor, or any other person because of race, color, religious creed, ancestry, national origin, age, or sex. CONTRACTOR shall take affirmative action to ensure that applicants are employed, and that employees or agents are treated, during employment, without regard to their race, color, religious creed, ancestry, national origin, age or sex. Such affirmative action shall include, but is not limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training. CONTRACTOR shall post in conspicuous places, available to all employees, agents, applicants for employment, and other persons a notice to be provided by the contracting agency setting forth the provisions of the non-discrimination clause.

2. CONTRACTOR shall, in advertisement or requests for employment placed by it or on its behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religious creed, ancestry, national origin, age or sex.

3. CONTRACTOR shall send each labor union or worker's representative with which it has a collective bargaining agreement or other contract or understanding, a notice advising said labor union or workers' representative of its commitment to this non-discrimination clause. Similar notice shall be sent to every other source of recruitment regularly utilized by the CONTRACTOR.

4. It shall be no defense to a finding of non-compliance with the Contract Compliance Regulation Commission or this non-discrimination clause that the CONTRACTOR had delegated some of its employment practices to any union, training program, or other source or recruitment which prevents it from meeting its obligations. However, if the evidence indicates that the CONTRACTOR was not on notice of the third-party discrimination or made a good faith effort to correct it, such factor shall be considered in mitigation in determining appropriate sanctions.

5. Where the practice of a union or any training program or other source of recruitment will result in the exclusion of minority group persons, so that the CONTRACTOR will be unable to meet its obligations under the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause, CONTRACTOR shall then employ and fill vacancies through other non-discriminatory employment procedures.

6. CONTRACTOR shall comply with the Contract Compliance Regulations of the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49 and with all state and federal laws prohibiting discrimination in hiring or employment opportunities. In the event of the CONTRACTOR's noncompliance with the non-discrimination clause of this CONTRACT, or with any such laws, this CONTRACT may, after hearing and adjudication, be terminated or

suspended, in whole or in part, and the CONTRACTOR may be declared temporarily ineligible for further contracts and other such sanctions may be imposed and remedies invoked as provided by the Contract Compliance Regulations.

7. CONTRACTOR shall furnish all necessary employment documents and records to, and permit access to its books, records, and accounts by the contracting agency, the Office of Administration, Bureau of Affirmative Action, and the Human Relations Commission for purposes of investigation to ascertain compliance with the provisions of the Contract Compliance Regulations, pursuant to 49.35 of the regulations cited above (relating to information concerning compliance by contractors). If CONTRACTOR does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the contracting agency, the Bureau of Affirmative Action or the COMMISSION.

8. CONTRACTOR shall actively recruit minority subcontractor or subcontractors with substantial minority representation among their employees.

9. CONTRACTOR shall include the provisions of the non-discrimination clause in every subcontract, so that such provisions will be binding upon each subcontractor.

10. The terms used in this non-discrimination clause shall have the same meaning as in the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49.

11. CONTRACTOR obligations under this clause are limited to the CONTRACTOR's facilities within Pennsylvania, or, where the contract is for the purchase of goods manufactured outside of Pennsylvania, the facilities at which such goods are actually produced.

CONTRACTOR: WITNESS:

_____

By:

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____, 20___.

Notary Public:
My Commission Expires:

BID FORM (General Construction)

Contract #16.200

Monroe County Historical Association
Stroud Mansion Heritage Center Expansion

DATED:_____

Bidder's Name and Address
(Bidder to insert date bid submitted)

(Print or Type)

_____

_____

_____

ALTERATIONS & HERITAGE CENTER COMPLEX
MONROE COUNTY HISTORICAL ASSOCIATION
900 Main Street
Stroudsburg, Pennsylvania 18360

To Whom It May Concern:

This Bid is submitted in accordance with your Advertisement inviting bids to be received for the General Construction Work to the Alterations & Heritage Center Complex located at 900 Main Street, Stroudsburg, PA 18360.

Having carefully examined the Contract Documents (as defined in Section 1.1.1 of Article 1 of the General Conditions), including all Addenda which are incorporated with these documents indicating various conditions affecting this contract, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the Contract for the above-named Project in accordance with said Contract Documents for:

TOTAL BASE BID – The contractor shall state the price for the completion of all work as indicated by the Contract Documents that is not included in the bid alternates listed below. Base Bid Price for all work indicated within the Contract Documents.

_____DOLLARS ($_____).

Accompanying this Proposal is a certified check, bank cashier's check, bank treasurer's check or Bid Bond required by Section 4.2 of the Instructions to Bidders, which is deposited as a proposal guarantee, and is to be retained by you and applied as provided in Paragraph 4.2.1 of Instruction to Bidders, in case the undersigned shall default in executing the Contract or in furnishing the required Bonds and insurance certificates within the time specified by the Contract Documents.

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 90 days after date set for bid opening, except as provided by Act 317 of 1978, approved November 26, 1978, which provides for possible extensions of the holding period.

The undersigned submits this Bid with the understanding that the Work of the Contract be Substantially Complete within four hundred twenty-five (425) consecutive calendar days as outlined in the Instructions to Bidders. This schedule of completion of the Work shall be considered of the essence of this Contract, subject to extensions of time as provided for in the General Conditions.

Should the Contractor fail to attain Substantial Completion on time as stipulated in the Agreement, the Owner shall agree to postpone the project delivery on condition that the Owner is entitled to claim, from Contractor, Liquidated Damages. If Substantial Completion is not reached after an initial grace period of four weeks, Liquidated Damages will be charged from the contract date of Substantial Completion. The rate of Liquidated Damages is charged at $300.00/day for every calendar day of delay. Further liabilities of the Owner for delay are excluded.

The undersigned contractor agrees to furnish all labor and materials for any additional work ordered by the Owner and for which no pre-agreed price has been fixed for the net cost of all labor and materials furnished plus 5% for overhead and profit.

The undersigned contractor agrees to procure permits and pass through the fee without markup to the Owner.

The contract amount stated above includes all sales taxes, excise, and other taxes for all materials and appliances subject to and upon which taxes are levied.

The undersigned shall provide the following completed and executed required attachments for a complete bid proposal:

1. Agreement of Surety
2. Bid Security
3. Non-Collusion Affidavit
4. Non-Discrimination Clause
5. Public Work Employment Verification Form
6. Contractor’s Qualification Statement (AIA A305)

ALTERNATES: The Owner reserves the right to accept or reject any of the following Alternates(s). The Owner reserves the right to consider Alternate Prices in determining the lowest responsible bidder. Alternate Prices shall include the cost of furnishing, installing all materials, labor, tools, equipment and other incidentals necessary to complete the work in accordance with the design intent, manufacturer's recommendations, building codes and the project specifications. Do not adjust material allowance under any alternate bids.

Alternate GC-01: State the amount to be ADDED to the Base Bid Sum to construct the courtyard site improvements on the south east corner of the property, as shown on drawing A001- Architectural Site Plan.

ADD_____Dollars ($_____)

Alternate GC-02: State the amount to be ADDED to the Base Bid Sum to install one manually operated partition at Community Room 111, as shown on drawing A101- First Floor Plan.

ADD_____Dollars ($_____)

Alternate GC-03: State the amount to be ADDED to the Base Bid Sum to install natural slate roofing (Grade S1, Weathering Black) in lieu of asphalt single roofing, at the steep slope roof area, as shown on drawing A104 – Roof Plan.

ADD_____Dollars ($_____)

ADDENDA ACKNOWLEDGEMENT: The undersigned hereby acknowledge receipt of following Addenda and has prepared this bid accordingly:

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

ADDENDUM #_____ Dated_____

Bids shall be officially signed in accordance with Instructions to Bidders, using applicable portion of "Signature Pages".

(Continued next page)

SIGNATURES

IN WITNESS WHEREOF, the undersigned has caused this Proposal to be executed as of the day and year indicated on the first page hereof.

(Individual Bidder)

Witness (Signature of Individual)

Trading and doing business as *_____

Business Address_____

//

(Partnership Bidder)

*_____
(Name of Partnership)

By: _____
Witness Partner

By: _____
Witness Partner

Business Address_____

The partners constituting the partnership herein named are:

Partner Address

Partner Address

//
*If fictitious or trade name is employed in conduct of business, insert name and complete, as appropriate, by deletion, the following statement: Foregoing fictitious or trade name (has) (has not) been registered as a (Partnership) (Individual) under Pennsylvania Law.

SIGNATURES

(Corporation Bidder)

**_____

(Name of Corporation)

By:_____ Attest:_____

(Vice President) (Assistant) Secretary

(CORPORATE SEAL)

Business Address_____

OR (if appropriate)

**_____

(Name of Corporation)

By: ***_____

Witness Authorized Representative

//

**(1) Complete, as appropriate, the following statement:

The Corporation has been organized and is existing under Laws of the _____

of_____.

(2) If Corporation has been organized under laws other than those of the Commonwealth of Pennsylvania, complete, as appropriate, by deletion, the following statement:

The Corporation (has) (has not) been granted a certificate of authority to do business in the Commonwealth of Pennsylvania under applicable laws.

//

***Attach appropriate proof, dated as the date of the Proposal, evidencing authority to execute in behalf of the Corporation in accordance with requirements of the Contract Documents.

AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor, *Construction Manager as Adviser Edition*

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

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

Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18360

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

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

Stroud Mansion Heritage Center Expansion Project
400 Main Street
Stroudsburg, PA 18360

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

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

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

The Owner and Contractor agree as follows.

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

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

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

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

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

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

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

[ ] Not later than four hundred twenty-five (425) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:

(Check the appropriate box.)

[X] Stipulated Sum, in accordance with Section 4.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

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

Item	Price

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

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

Should the Contractor fail to attain Substantial Completion on time as stipulated in the Agreement, the Owner shall agree to postpone the project delivery on condition that the Owner is entitled to claim, from Contractor, Liquidated Damages. If Substantial Completion is not reached after an initial grace period of 4 weeks, Liquidated Damages will be charged from the contract date of Substantial Completion. The rate of Liquidated Damages is charged at $300.00/day for every calendar day of delay. Further liabilities of the Owner for delay are excluded.

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 21st day of the following month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

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

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

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

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

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

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress

payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

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

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

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

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or

exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

.1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

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

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

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

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

10%

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

Contractor may reduce retainage to 5% at 50% completion. Owner and Architect are required to approve the reduction in retainage prior to the issuance of the Application for Payment by the Contractor.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

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

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

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

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[X] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[ ] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

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

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's

interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

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

[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

(Paragraphs deleted)
(Table deleted)

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

Additions and Deletions Report for

AIA® Document A132™ – 2019

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 16:42:42 ET on 01/25/2023.

PAGE 1

Monroe County Historical Association
900 Main Street
Stroudsburg, PA 18360

...

Stroud Mansion Heritage Center Expansion Project
400 Main Street
Stroudsburg, PA 18360

...

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

PAGE 3

[ ] Not later than four hundred twenty-five (425) calendar days from the date of commencement of the Work.

...

[X] Stipulated Sum, in accordance with Section 4.2 below

PAGE 4

~~**§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price**~~
~~**§ 4.3.1** The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.~~

~~**§ 4.3.2** The Contractor's Fee:~~
~~*(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)*~~

~~**§ 4.3.3** The method of adjustment of the Contractor's Fee for changes in the Work:~~

~~**§ 4.3.4** Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:~~

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed ( ) percent (%) of the standard rental rate paid at the place of the Project.

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price
§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed ( ) percent (%) of the standard rental rate paid at the place of the Project.

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

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

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

~~Item~~ ~~Price~~

~~§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:~~
~~*(Identify each assumption.)*~~

...

Should the Contractor fail to attain Substantial Completion on time as stipulated in the Agreement, the Owner shall agree to postpone the project delivery on condition that the Owner is entitled to claim, from Contractor, Liquidated Damages. If Substantial Completion is not reached after an initial grace period of 4 weeks, Liquidated Damages will be charged from the contract date of Substantial Completion. The rate of Liquidated Damages is charged at $300.00/day for every calendar day of delay. Further liabilities of the Owner for delay are excluded.

PAGE 5

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 21st day of the following month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the Construction Manager receives the Application for Payment.

PAGE 8

10%

...

Contractor may reduce retainage to 5% at 50% completion. Owner and Architect are required to approve the reduction in retainage prior to the issuance of the Application for Payment by the Contractor.

PAGE 9

[**X**] Arbitration pursuant to Article 15 of AIA Document A232–2019.

PAGE 12

~~[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:~~
~~*(Insert the date of the E235-2019 incorporated into this Agreement.)*~~

~~[ ] The Sustainability Plan:~~

~~Title~~ ~~Date~~ ~~Pages~~

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd O. Chambers, AIA, 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 16:42:42 ET on 01/25/2023 under Order No. 2114397647 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A132™ – 2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
Stroud Mansion Heritage Center Expansion Project
900 Main Street
Stroudsburg, Pennsylvania 18360

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

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.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Signed and sealed this day of ,

(Contractor as Principal)	*(Seal)*
(Witness)	*(Title)*
(Surety)	*(Seal)*
(Witness)	*(Title)*

Additions and Deletions Report for

AIA® Document A310™ – 2010

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PAGE 1

Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

...

Stroud Mansion Heritage Center Expansion Project
900 Main Street
Stroudsburg, Pennsylvania 18360

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd Chambers, AIA, 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 17:05:47 ET on 12/21/2022 under Order No. 6263448050 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A310™ – 2010, Bid Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
Stroud Mansion Heritage Center Expansion Project
(Row deleted)
BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL	**SURETY**
Company: *(Corporate Seal)*	Company: *(Corporate Seal)*
Signature: _____	Signature: _____
Name and Title:	Name and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)
MKSD, LLC
Architect
1209 Hausman Road, Suite A
Allentown, Pennsylvania 18104

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.
/

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

Additions and Deletions Report for

AIA® Document A312™ – 2010

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PAGE 1

Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

...

Stroud Mansion Heritage Center Expansion Project

...

MKSD, LLC
Architect
1209 Hausman Road, Suite A
Allentown, Pennsylvania 18104

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd Chambers, AIA, 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 17:04:56 ET on 12/21/2022 under Order No. 6263448050 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Performance Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
Stroud Mansion Heritage Center Expansion Project
(Row deleted)
BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)
MKSD,LLC
Architect
1209 Hausman Road
Suite A
Allentown, Pennsylvania 18104

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.
/

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

Additions and Deletions Report for

AIA® Document A312™ – 2010

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 17:03:45 ET on 12/21/2022.

PAGE 1

Monroe County Historical Association
900 Main Street
Stroudsburg, Pennsylvania 18360

...

Stroud Mansion Heritage Center Expansion Project

...

MKSD,LLC
Architect
1209 Hausman Road
Suite A
Allentown, Pennsylvania 18104

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd Chambers, AIA, 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 17:03:45 ET on 12/21/2022 under Order No. 6263448050 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Payment Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

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

Stroud Mansion Heritage Center Expansion Project
400 Main Street
Stroudsburg, PA 18360

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

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

Monroe County Historical Association
400 Main Street
Stroudsburg, PA 18360

THE ARCHITECT:
(Name, legal status, and address)

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

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.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

Init.
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TABLE OF ARTICLES

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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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 other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 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.

§ 1.1.8 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.

§ 1.1.9 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.

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building

Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

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

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do 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. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 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 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

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

§ 2.3.6 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.

§ 2.3.7 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.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 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 review by the Construction Manager and prior approval of the Architect, and the Construction Manager or 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 Construction Manager's and Architect's and their respective consultants' 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 Construction Manager or Architect in their 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 2.3.5, 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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, the Construction Manager, and the 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. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager 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 the Project 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, in consultation with the Construction Manager, 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, Construction Manager, 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 Construction Manager or 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 or portions thereof 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 The Contractor shall procure and pay for the permit as pass thru change order expense without markup. The Contractor shall secure and pay 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, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, 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, in consultation with the Construction Manager, 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, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either 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, Construction Manager, and Architect. If the Contractor is unsure of which resources may be of historic or archeological significance when encountering unknown, underground features not previously identified, the Contractor should inquire with the Owner and Construction Manager, and he/she will provide information and direction to the Contractor. Do not damage or proceed with work activities in that area. All items discovered, which in the opinion of the Owners, have archaeological or historical significance, shall remain the property of the Owner. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15."

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents:

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

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager 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, Construction Manager, 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, and the Construction Manager's use in developing the Project schedule, 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. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 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 Construction Manager's and Architect's approval. The Architect and Construction Manager'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 Construction Manager and 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 participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 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 Construction Manager, Architect, and Owner, and delivered to the Construction Manager 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 and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 Construction Manager and 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 Construction Manager and 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, the Architect, and the Construction Manager 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 Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 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 Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

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

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and 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 AND CONSTRUCTION MANAGER

§ 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 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The General Contractor shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and 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, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager 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 Construction Manager 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 other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 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. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and 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.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the

Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 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 Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.19 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 so rendered in good faith.

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

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request 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 other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 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 Construction Manager, for review by the Owner, Construction Manager 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 Construction Manager may

notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager 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, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager 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, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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 with Own Forces and to Award Other Contracts

§ 6.1.1 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 the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 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's own forces, Separate Contractors, Construction Manager and other 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's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and 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 or other Contractors' 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 Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 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, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors 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, other 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 Construction Manager, with notice to 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, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager 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

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, 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 Construction Manager and signed by the Owner, Construction Manager 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 Construction Manager 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 Construction Manager 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 Construction Manager and 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 Construction Manager 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 Construction Manager and 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 Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The 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 Construction Manager and 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 Construction Manager shall 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 Construction Manager 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 Construction Manager 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, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (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, based on the recommendation of the Construction Manager, 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 Construction Manager, 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 Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or 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 fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager 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, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien 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 Construction Manager and 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 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager'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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation 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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 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 Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or 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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or 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 or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the 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 or other 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 or Construction Manager withholds certification for payment under Section 9.5.1, 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 Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project 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 Construction Manager and 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 Construction Manager 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 Owner, Construction Manager and Architect 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, Construction Manager 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 Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager 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 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 notify the Construction Manager, and the Contractor and Construction Manager shall jointly 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 list, the Architect, assisted by the Construction Manager, 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 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, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, 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 completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their 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 Construction Manager's and Architect's final Certificate for Payment or Project 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 through the Construction Manager (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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and 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 through the Construction Manager 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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 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;
- **.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; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4. 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, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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

§ 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, Construction Manager 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, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager 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, Construction Manager, Architect, their 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, Construction Manager and Construction Manager's consultants, and the 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 directly to the Owner, and separately to the Construction Manager, 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 both the Contractor and the Construction Manager, separately and 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 directly to the Contractor, and separately to the Construction Manager, 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 Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) 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 Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, 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, Architect, and Construction Manager 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 Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, 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 Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their 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 Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or 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 Construction Manager or 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 Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

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

a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager 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, Separate Contractors, or other 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, Construction Manager, 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager, 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 Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager's and 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 Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or 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 Construction Manager has not certified or 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, 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, Construction Manager 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 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, Construction Manager and 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, after consultation with the Construction Manager, 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 Construction Manager's and 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, 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 the 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 this 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 Construction Manager and 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, the Construction Manager, 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 of 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 A232™ – 2019

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 16:42:29 ET on 01/25/2023.

PAGE 1

Stroud Mansion Heritage Center Expansion Project
400 Main Street
Stroudsburg, PA 18360

...

Monroe County Historical Association
400 Main Street
Stroudsburg, PA 18360

...

MKSD,LLC
1209 Hausman Road, Suite A
Allentown, PA 18104
PAGE 8

§ 3.7.1 ~~Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.~~ The Contractor shall procure and pay for the permit as pass thru change order expense without markup. The Contractor shall secure and pay 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.
PAGE 9

§ 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, Construction Manager, and Architect. If the Contractor is unsure of which resources may be of historic or archeological significance when encountering unknown, underground features not previously identified, the Contractor should inquire with the Owner and Construction Manager, and he/she will provide information and direction to the Contractor. Do not damage or proceed with work activities in that area. All items discovered, which in the opinion of the Owners, have archaeological or historical significance, shall remain the property of the Owner. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain ~~governmental~~ authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article ~~15.~~15."
PAGE 13

§ 4.2.3 The ~~Construction Manager~~ General Contractor shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and

Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Todd O. Chambers, AIA, 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 16:42:29 ET on 01/25/2023 under Order No. 2114397647 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A232™ – 2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 5010 SUPPLEMENTARY GENERAL CONDITIONS

The following Supplementary General Conditions, change, delete from or add to the "**General Conditions of the Contract for Construction" AIA Document A232, 2017 Edition**. Where any article of General Conditions is modified or any paragraph, subparagraph or clause thereof is modified, changed, deleted from or added to by these Supplementary Conditions, the unaltered provisions of the article, paragraph, subparagraph or clause shall remain in effect.

The General Conditions also may be supplemented elsewhere in the contract documents by provisions located in, but not necessarily limited to, Division 1 - General Requirements of the Specifications.

ARTICLE 1 - GENERAL PROVISIONS

Paragraph 1.7 – TRANSMISSION OF DATA IN DIGITAL FORM

1.7 Issuance Agreement form and Order form: Refer to the last two pages of this section.

ARTICLE 11 - INSURANCE AND BONDS

Paragraph 11.1 - CONTRACTOR'S LIABILITY INSURANCE

Amplify Paragraph 11.1, Contractor's Liability Insurance, by adding the following:

[*Add:*] During the term of the Contract, the Contractor and each Subcontractor shall, at their own cost and expense, maintain the following insurance in a company or companies properly licensed and satisfactory to the Owner with an A.M. Best Financial rating of A-/VII or better:

1. Employer's Liability Insurance

   (a) Statutory:
   Amounts and coverage as required by law.
   (b) Employer's Liability:
   $100,000 each accident.
   $500,000 disease, policy limit.
   $100,000 disease, each employee.

2. Comprehensive General Liability Insurance including coverage for direct operations, sublet work, demolition and wrecking, elevators, and contractor liability with limits not less than stated below:

   (a) Bodily Injury Liability including Personal Injuries:
   $1,000,000 each occurrence.
   (b) Property Damage Insurance: Shall include explosion, collapse and underground.
   $1,000,000 each occurrence.
   (c) Products and completed operations insurance shall be maintained in the amount of $1,000,000.00 for a minimum period of 2 years after final payment, and the Contractor shall continue to provide evidence of such

coverage to the Owner on an annual basis during the aforementioned period.

(d) Contractual Liability
    1. Bodily injury - $1,000,000 each occurrence.
    2. Property damage - included each occurrence and aggregate.

(e) Personal/advertising injury liability in the amount of $1,000,000.00.

(f) The General Aggregate Limit shall be no less than Two Million Dollars ($2,000,000.00) and shall include a per project or per location endorsement.

3. Automobile Liability Insurance including coverage for owned, non-owned and hired vehicles with limits not less than stated below:

   (a) $1,000,000.00 each accident combined single limit.

4. Pollution Liability:

   Shall be provided in addition to all other insurances for sudden and accidental exposures only and shall be required for the HVAC, Plumbing Contractor, General Contractor, and Asbestos Abatement Contractor only - $1,000,000 per occurrence. The intent of this policy is to cover accidental discharges from construction activities.

5. Excess Liability

   The Contractor shall purchase an Excess Liability policy of insurance providing no less than a four million dollar ($4,000,000) per occurrence limit and a $4,000,000 aggregate limit to include a per project or per location endorsement.

6. Contractors

   Supply the Owner with certificates of insurance as listed above for Contractors.

11.3 PROPERTY INSURANCE

11.3.1 DELETE in its entirety and ADD: The Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in Pennsylvania, and maintaining an A.M. Best rating of A- or greater, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis with the minimum deductibles required by the insurer or insurers underwriting such coverage. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in the Contract Documents or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Architect, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.3.1.1 DELETE in its entirety and ADD: Property insurance required by Subparagraph 11.3.1. shall be written on an "all-risk" policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

11.3.1.2 DELETE in its entirety.

11.3.1.3 DELETE in its entirety and ADD: The Contractor shall be responsible for paying all costs not covered, including any deductibles, required by the insurer or insurers underwriting the insurance required by Paragraph 11.3.1 and incurred for individual items and operating systems prior to the issuance of Substantial Completion (in whole or in part) or due to the Contractor's negligence or breach of contract.

Subparagraph 11.3.3

Delete the last sentence of subparagraph 11.3.3 in its entirety.

11.3.4 DELETE in its entirety.

11.3.5 DELETE in its entirety.

11.3.6 DELETE in its entirety.

11.3.7 DELETE in its entirety.

11.3.8 DELETE in its entirety.

11.3.9 DELETE in its entirety.

11.3.10 DELETE in its entirety.

Attachment: Computer File Issuance Agreement
End of Section 00 5010

MKSD, LLC

COMPUTER FILE ISSUANCE AGREEMENT

Project Name: _____

Project Number: _____ Date: _____

Requesting Party: _____

hereinafter referred to as the Party, understands and agrees that the data, calculations, drawings or specifications prepared pursuant to this Agreement, whether in hard copy or machine readable form, are instruments of professional service intended for one-time use in the construction or implementation of this project or service provided. They are and shall remain the property of MKSD, LLC The Party may retain copies, including copies stored on magnetic tape or disk, for information and reference in connection with the work provided, use or occupancy of the project or service.

Because of the possibility that information and data delivered in machine-readable form may be altered, whether inadvertently or otherwise, MKSD, LLC reserves the right to remove from copies provided to the Party, all identification reflecting the involvement of MKSD, LLC or its agents/consultants in their preparation, and to retain originals of all project documentation delivered to the Party in machine-readable form, which originals shall be referred to and shall govern in the event of any inconsistency between the two. MKSD, LLC bears no responsibility for unauthorized use of information contained herein. The Party understands that the conversion and transfer of data to machine-readable form cannot be accomplished without the possible introduction of inexactitudes, anomalies, and errors. The Party agrees to assume all risks associated with the use of this data.

The Party recognizes that changes or modifications to these instruments of professional service introduced by anyone other than MKSD, LLC may result in adverse consequences which MKSD, LLC can neither predict nor control. Therefore, and in consideration of this Agreement to deliver its instruments of professional service in machine-readable form, the Party, and any of its agents who may rely on this data, agrees to hold fully harmless and indemnify MKSD, LLC from and against all claims, expenses, liabilities, losses, damages and costs, including but not limited to attorney's fees, arising out of or in any way connected with changes, modifications, accuracy or completeness of any translation process from original files, misinterpretation, misuse, or reuse by others of the machine-readable information and data provided by MKSD, LLC under this Agreement. The foregoing indemnification applies, without by limitation, to any use of the project documentation on other projects, for additions to this project, or for completion of this project by others, excepting only such use as may be authorized in writing, by MKSD, LLC and with appropriate compensation to MKSD, LLC These files represent the status of project or service as of the transmittal date or transfer and in no event shall MKSD, LLC be liable to anyone for special, collateral, incidental or consequential damages in connection with the use of these materials.

_____
MKSD, LLC Project Principal

Acknowledged By

_____
Company (typed) Date

_____
Signature of the Authorized Party Noted Above

Upon receipt of the signed confirmation of this Agreement Form and applicable payment, MKSD, LLC will return a copy of this form along with the machine-readable format desired and described in the accompanying transmittal.

MKSD, LLC
ELECTRONIC FILE ORDER FORM

Requested by: _____ Date: _____

(Company name)

MKSD Electronic File Processing Fee Schedule

1)	AutoCAD drawing files (backgrounds only)	$50.00	per drawing sheet
2)	Specification files	$100.00	per Volume

CAD Files

Please provide a list of all drawing sheet numbers requested in the space below

Note: All MKSD CAD files will be distributed in **AutoCAD Release 2012** format unless otherwise requested below.

_____ MKSD, LLC CAD Files Requested @ $50.00 per sheet = _____

(Qty.)

Specifications

Please circle the Volumes requested:

Volume 1 Volume 2 Volume 3

Note: All specifications are in PDF format

_____ MKSD Specification Volumes @ $100.00 per Volume =

(Qty.)

Please circle the method of delivery: e-mail postal mail (on disc)

Please provide e-mail or mailing address:

_____

Total CAD Files _____

_____ _____

(Signature) Date

Total Specifications _____

_____

(Company Name) Total Processing Fee Due _____

Upon receipt of this signed Order Form and applicable processing fee payment, MKSD, LLC will return a copy of this form along with the transmittal of the requested electronic files.

END OF SECTION 00 5010

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00 0800 - PENNSYLVANIA STATUTORY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section specifies Federal and State statutes, rules and regulations that must be complied with during execution of project work.

1. Prime Contracts: Provisions of this section apply to Work of each Prime Contractor

B. Related Sections: the following documents and sections contain requirements that relate to this section:

1. Document 00 0700 “General Conditions” for compliance with laws, regulations, permits, fees and notices that are a part of this project.

2. Document 00 0750 “Supplementary General Conditions” for taxes, permits, fees and notices that are a part of this project.

3. Division 01 section “Reference Standards and Definitions” for list of standards referenced in project manual.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A. Abide by and comply with all applicable Federal, State and local codes – including Occupational Safety and Health Administration (OSHA) “Construction Standards” of U.S. Department of Labor.

B. Access for persons with Physical Disabilities: Comply with ADA including ADA Accessibility Guidelines. Documents are available from U.S. Department of Justice, Civil Rights Division, 1.202.514.0301 and from ATBCB, 1.800.872.2253.

C. Fully comply with Act 247 of 1972 Session of General Assembly of Commonwealth of Pennsylvania, and ensure compliance by lower tier contractors.

D. Discrimination Prohibited: According to 62 PA. C.S.A. §3701, the contractor agrees that:
1. In hiring of employees for the performance of work under the contract or any subcontract, no contractor, subcontractor or any person acting on behalf of the contractor or subcontractor shall by reason of gender, race, creed or color discriminate against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

2. No contractor or subcontractor or any person on their behalf shall in any manner discriminate against or intimidate any employee hired for the performance of work under the contract on account of gender, race, creed or color.

3. The contract may be canceled or terminated by the government agency and all money due or to become due under the contract may be forfeited for a violation of the terms or conditions of that portion of the contract.

E. HUMAN RELATIONS ACT: The provisions of the Pennsylvania Human Relations Act, Act 222 of October 27, 1955 (P.L. 744) (43 P.S. Section 951, et. Seq.) of the Commonwealth of Pennsylvania prohibit discrimination because of race, color, religious creed, ancestry, age, sex, national origin, handicap or disability, by employers, employment agencies, labor organizations, contractors and others. The contractor shall agree to comply with the provisions of this Act as amended that is made part of this specification. Your attention is directed to the language of the Commonwealth's non-discrimination clause in 16 PA. Code 49.101. \

F. PENNSYLVANIA PREVAILING WAGE RATE: This regulation and general Pennsylvania prevailing minimum wage rates (Act 422 of 1961, P.L. 987, as amended by Act 342 of 1963, P.L. 653). If the total project sum exceeds $25,000.00, this regulation and the general prevailing minimum rage rates, as determined by Secretary of Labor and Industry, which shall be paid for each craft or classification of all workers needed to perform contract during anticipated term therefore in locality in which public work is performed, are made part of this specification.

G. STANDARD OF QUALITY: The various materials and products specified in the specifications by name or description are given to establish a standard of quality and of cost for bid purposes. It is not the intent to limit the bidder, the bid or the evaluation of the bid to any one material or product specified but rather to describe the minimum standard. When proprietary names are used, they shall be followed by the words "or alternatives of the quality necessary to meet the specifications. " A bid containing an alternative which does not meet the specification may be declared non-responsive. A bid containing an alternative may be accepted, but, if an award is made to that bidder, the bidder will be required to replace any alternatives which do not meet the specifications.

H. PROVISION FOR THE USE OF STEEL AND STEEL PRODUCTIONS MADE IN THE U.S.: In accordance with Act 3 of the 1978 General Assembly of the Commonwealth of Pennsylvania, if any steel or steel products are to be used or supplied in the performance of the contract, only those produced in the United States as defined therein shall be used or supplied in the performance of the contract or any subcontracts thereunder.

In accordance with Act 161 of 1982, cast iron products shall also be included and produced in the United States. Act 141 of 1984 further defines "steel products" to include machinery and equipment. The act also provides clarifications and penalties.

I. CASH ALLOWANCES: Cash allowances are not to be included in the bid specifications.

J. CIVIL RIGHTS ACT of 1964

1. Contractor agrees to be bound by and comply with provisions of Act of Congress of United States of July 2, 194, commonly known as “Civil Rights Act of 1964,: P.L. 88-352; 42 U.S.C.A Section 2000a, et seq., together with all Rules, Regulations, and Executive Orders issued pursuant thereto, insofar as said Act, Rules, Regulations and Executive Orders may be applicable to work performed under this Contract.

K. Bidder is hereby notified that this project is subject to those statutes, rules and regulations shown below and must be carried out in compliance with those statutes, rules and regulations.

1. State Law

I. Purdon’s Statues – title 3 (Agriculture)

PA Fertilizer Law of 1956, Act of May 29, 1956 (P.L. (1955) 1795, No. ___), as amended, 3 P.S. 68.1 et seq.

PA Pesticide Control Act of 1973, Act of March 1, 1974 (P.L. 90, No. 24), as amended, 3 P.S. 111.21 et seq.

Agricultural Liming Materials Act, Act of March 17, 1978 (P.L. 15, No. 9), as amended, 3 P.S. 132-1 et seq.

The PA Plant Pest Act of 1937, Act of April 21, 1937 (P.>L. 318, No ___), as amended, 3 P.S. 214.1 et seq. and regulations promulgated pursuant thereto.

Noxious Weed Control Law, Act of April 7, 1982 (P.L. 228, No. 74), as amended, 2 P.S. 2551.1 et seq.

Soil Conservation Law, Act of May 15, 1945 (P.L. 547, No. ___), as amended, 3 P.S. 849 et seq.

(Relating to weather modification), Act of January 19, 1968 (P.L/ (1967) 1024, No.___), as amended, 3 P.S. 1101 et seq.

II. Purdon’s Statutes – Title 16 (Counties)

Local Health Administrative Law, Act of August 24, 1951 (P.L. 1304_ 16 P.S. 1201 et seq.

(Relating to land use), Act of January 13, 1966 (P.L. (1965) 1292, No. ___), as amended, 16 P.S. 11941 et seq.

III. Purdon’s Statutes – Title 18 (Crimes and Offenses)

The Crime Code, Act of December 6, 1972 (P.L. 1482, No. 334), as amended, 18 Pa. C.S.A. 101 et seq.

Penal Code, Act of June 24, 1939 (P.L. 872), as amended, 18 P.S. 4101, et seq.

IV. Purdon's Statues – Title 24 (Education)

Public School Code of 19749, Act of March 10, 1949 (P/L 30, No. ___), as amended, 24 P.S. 7-741 et seq.

V. Purdon's Statutes – Title 30 (Fish)

The Fish and Boat Code, Act of October 16, 1980 (P.L. 996, No. 175), as amended, 30 Pa, C.S.A. 101 et seq. and regulations promulgated pursuant thereto.

VI. Purdon's Statutes – Title 31

Pennsylvania Meat and Poultry Hygiene Law of 1968, Act of July 9, 1969 (P.L. 304), 31 P.S. 483.1 et seq.

Milk Sanitation Law, Act of 1935, 31 P.S. 645 to 660g.

VII Purdon's Statutes – Title 32 (Forests, Waters and State Parks)

(Relating to water power and water supply permits), Act of June 14, 1923 (P.L. 704, No. ___), as amended, 32 P.S. 591 et seq.

Water Power and Water Supply Act, Act of June 14, 1923 (P.L. 704 Section 7), 32 P.S. 597; Section 1920-A of Administrative Code, 71 P.S. 510-520 and Department of Environmental Resources regulations promulgated under all three acts.

Water Well Drillers License Act, Act of May 29, 1956 (P.L. (1955) 1840, No. ___), as amended, 32 P.S. 645.1 et seq. and Department of Environmental Resources regulations promulgated thereunder.
(Relating to Prevention and Control of Floods), as amended, 32 P.S. 651 et seq.

(Relating to Flood Control), Act of August 7, 1936 (P.L. 106, 1st Ex. Sess., No. 46), as amended, 32 P.S. 653 et seq.

Stream Clearance Act, Act of June 5, 1947 (P.L. 420), as amended, 32 P.S. 659 et. seq.

Flood Plain Management Act, Act of October 4, 1978 (P.L. 851, No. 166), as amended, 32 P.S. 679101 et seq.

Storm Water Management Act, Act of October 4, 1978 (P.L. 864, No. 167) as amended, 32P.S. 701 et seq.

Dam Safety and Encroachments Act, Act of November 26, 1979 (P.L. 1375, No. 325), as amended, 32 P.S. 693.1 et seq., as amended and regulations promulgated thereto.

(Relating to Stream Clearance), Act of June 5, 1947 (P.L. 422, No. ___), as amended, 32 P.S. 701 et seq.

(Relating to Potomac River Pollution), Act of May 29, 1945 (P.L. 1134, No. ___), as amended, 32 P.S. 741 et seq. (repealed in part 5-1-81).

(Relating to Schuylkill River Pollution), Act of June 4, 1945 (P.L. 1383, No.___), as amended, 32 P.S. 751.1 et seq.

(Relating to Delaware River Pollution) Act of April 19, 1945 (P.L. 272, No. ___), as amended, 32 P.S. 815.31 et seq.

Delaware River Basin Compact, Act of July 7, 1961 (P.L. 518, No. ___), as amended, 32 P.S. 815.101 et seq.

Ohio River Valley Water Sanitation Compact, Act of April 2, 1945 (P.L. 103, No. ___), as amended, 32 P.S. 817.1 et seq.

Great Lakes Basin Compact, Act of March 22, 1956 (P.L. (1955) 1333, No. ____), as amended 32 P.S. 816.1-816.6.

Brandywine River Valley Compact, Act of September 9, 1959 (P.L. 848, No.___), as amended, 32 P.S. 818 et seq.

Wheeling Creek Watershed Protection and Flood Prevention District Compact, Act of August 2, 1967 (P.L. 189, No.___), as amended, 32 P.S. 819.1 et seq.

Susquehanna River Basin Compact, Act of July 17, 1968 (P.L. 368, No. 181), as amended, 32 P.S. 820.1 et seq.

Chesapeake Bay Commission Agreement, Act of June 25, 1985 (P.L. 64, No. 25), as amended, 32 P.S. 820.11 et seq.

Pennsylvania Scenic Rivers Act, Act of December 5, 1972 (P.L. 1277), 32 P.S. 820.21 et seq.

Stoney Creek Wild and Scenic River Act, Act of March 24, 1980 (P.L. 50), 32 P.S. 820.41 et seq.

Schuylkill Scenic River Act, Act of November 26, 1978 (P.L. 1415), 32 P.S. 820.31 et seq.

French Creek Scenic Rivers Act, Act of April 29, 1982 (P.L. 351), 32 P.S. 820.51 et seq.

Lehigh Scenic River Act, Act of April 5, 1982 (P.L. 222), 32 P.S. 820.61 et seq.

Lick River Wild and Scenic River Act, Act of December 17, 1982 (P.L. 1402), 32 P.S. 820.71 et seq.

Octoraro Creek Scenic River Act, Act of October 21, 1983 (P.L. 171) 32 P.S. 820.81 et seq.

Outdoor Advertising Control Act, Act of December 15, 1971, 32 P.S. 2718.101 et seq.

(Relating to Preservation and Acquisition of Land for Open Space Uses), Act of January 19, 1968 (P.L. (1967) 992, No.___), as amended, 32 P.S. 5201 et seq.

Land and Water conservation and Reclamation Act, Act of January 19, 1968 (P.L. (1967) 996, No.___), as amended, 32 P.S. 5101 et seq.

Bluff Recession and Setback Act, Act of May 13, 1980 (P.L. 122 No. 48), as amended, 32 P.S. 5201 et seq.

Wild Resource Conservation Act, Act of June 23, 1982 (P.L. 597, No. 170), as amended, 32 P.S. 5301 et seq. and regulations promulgated pursuant thereto.

Recreational Improvement and Rehabilitation Act, Act of July 2, 1984 (P.L. 527), 32 P.S. 5401 et seq. and guidelines promulgated pursuant thereto.

Water Faculties Restoration Act, Act of June 22, 1982 (P.L. 277), 32 Pa. C.S.A. 7501 et seq. and regulations promulgated pursuant thereto.

VIII. Purdon's Statutes – Title 34 (Game)

The Game and Wildlife Code, Act of July 8, 1986 (P.L. 442, No. 93), as amended, 34 Pa. C.S.A. 101 et. seq.

IX. Purdon's Statutes – Title 35 (Health and Safety)

(Related to public eating and drinking places), Act of May 23, 1945 (P.L. 926, No.___), as amended, 35 P.S. 655.1 et seq.

The Public Bathing Law, Act of June 23, 1931 (P.L. 899, No.___), as amended, 35 P.S. 672 et seq.

The Clean Streams Law, Act of June 22, 1937 (P.L. 1987, No. __), as amended, 35 P.S. 691.1 et seq. and Department of Environmental Resources regulations promulgated thereunder. (Related to Commonwealth Contribution to cost of Abating Pollution) Act of August 20, 1953 (P.L. 1217, No.___), as amended, 35 P.S. 701 et seq.

PA Safe Drinking Water Act, Act of May 1, 1984 (P.L. 206, No. 43) as amended, 35 P.S. 721.1 et seq. and regulations promulgated pursuant thereto.

(Relating to Water Supply Sources Protection), Act of January 18, 1952 (P.L. 2148), as amended, 35 P.S. 731, 732.

PA Sewage Facilities Act, Act of January 24, 1966 (P.L. (1965) 1535, No. ___), as amended, 35 P.S. 750.1 et seq. and Department of Environmental Resources regulation promulgated thereunder.

PA Solid Waste-Resource Recovery Development Act, Act of July 20, 1974 (P.L. 572, No. 198), as amended, 35 P.s. 755.1 et seq. and regulations promulgated pursuant thereto.

(Related to pollution from abandoned mines), Act of December 15, 1965 (P.L. 1075, No.___), as amended, 35 P.S. 760.1 et seq.

(Related to burial of radioactive materials), Act of September 8, 1959 (P.L. 807, No.___), as amended, 35 P.S. 958.1 et seq.

Housing and Redevelopment Assistant Law, Act of May 20, 1949 (P.L. 1633), 35 P.S. 1661 et seq. as amended.

Industrialized Housing Act, Act of May 11, 1972 (P.L. 286), 35 P.S. 1651.1 et seq. as amended and regulations promulgated pursuant thereto.

Uniform Standards code for Mobile Homes Act 69, Act of May 11, 1972 (P.L. 281), 35 P.S. 1656.1 et seq. and regulations promulgated pursuant thereto.

Manufactured housing Construction and Safety Standards Authorization Act, Act of November 17, 1982 (P.L. 676) 35 P.S. 1656.1 et seq. and regulations promulgated pursuant thereto.

Housing Finance Agency Law 9P.L. 1688 (1959)), 35 P.S. 1680.101 et seq. and regulations promulgated pursuant thereto.

Urban Redevelopment Law, Act of November 16, 1967 (P.L. 498), 35 P.S. 1701 et seq.

(Related to Camp Regulation), Act of November 10, 1959 (P.L. 1400 No.___), as amended 35 P.S. 3001 et seq.

Air Pollution Control Act, Act of January 8, 1969 (P.L. (1959) 2119, No.___), as amended 35 P.S. 4001 et seq.

Uniform Interstate Air Pollution Agreements Act, Act of February 17, 1972, 35 P.S. 4101 et seq.

Solid Waste Management Act, Act of July 7, 1980 (P.L. 380, No. 97), as amended, 35 P.S. 6018.101 et seq. and Department of Environmental Resources regulation promulgated thereunder.

Emergency Management Services Code, Act of November 26, 1978 (P.L. 1332), 35 Pa. C.S. A. 7101 et seq.

Radiation Protection Act, Act of July 10, 1984 (P.L. 688, No. 147), as amended, 35 P.S. 71101.101 et seq. and regulations promulgated pursuant thereto.

Building Energy Conservation Act, Act of December 15, 1980 (P.L. 1203) 35 P.S. 7201.102 et seq. and regulations promulgated pursuant thereto.

Worker and Community Right-to-Know Act, Act of October 5, 1984 (P.L. 734, No. 159), as amended, 35 P.S. 7301 et seq. and regulations promulgated pursuant thereto.

Radon Gas Demonstration Project and Home Improvement Loan Act, Act of May 16, 1986 (P.L. 203), 35 P.S. 7501 et seq.

X. Purdon's Statutes – Title 6 (Highways and Bridges)

State Highway Law, Act of June 1, 1945 (P.L. 1242, No. ___), as amended, 36 P.S. 670-101 et seq.

(Related to Roadside Landscaping and Scenic Development), Act of September 17, 1966 (P.L. 94), 36 P.S. 670-413.1

(Related to Junkyards along Highways), Act of July 29, 1966 (P.L. 991, Sp. Sess. No.___), as amended 36 P.S. 2719.1 et seq.

Highway Vegetation Control Act, Act of December 20, 1983 (P.L. 293, No. 79), as amended, 36 P.S. 2720.1 et seq.

XI. Purdon's Statutes – Title 43 (Labor)

(Related to General Safety), Act of May 19, 1937 (P.L. 654, No.___), as amended, 43 P.S. 25-1 et seq.

Seasonal Farm Labor Act, Act of June 23, 1978 (P.L. 537, No. 93), as amended, 43 P.S. 1301.101 et seq.

XII. Purdon's Statutes – Title 52 (Mines and Mining)

The Coal Mine Sealing Act of 1947, Act of June 30, 1947 (P.L. 1177, No. ___), as amended, 52 P.S. 28.1 et seq.

Coal Refuse Disposal Control Act, Act of September 24, 1968 (P.L. 1040, No. 318), as amended, 52 P.S. 30.51 et seq. and regulations promulgated pursuant thereto.

(Related to Coal Land Improvement), Act of July 19, 1965 (P.L. 216, No. 117) as amended, 53 P.S. 30.101 et seq.

(Related to Mine Fines and Subsidence), Act of April 3, 1968 (P.L. 92, No. 42), as amended, 52 P.S. 30.201 et seq.

PA Anthracite Coal mine Act, Act of November 10, 1965 (P.L. 721, No. 346), As amended, 52 P.S. 70-101 et seq.

(Related to discharge of coat into banks of streams), Act of June 27, 1913 (P.L. 640. No.___), as amended, 52 P.S. 631 et seq.

(Related to Caving-in, Collapse, Subsidence) Act of May 27, 1921 (P.L. 1198, No.___), as amended, 53 P.S. 661 et seq.

(Related to Subsidence), Act of September 20, 1961 (P.L. 1538, No.___), as amended, 52 P.S. 672.1 et seq.

Anthracite Strip Mining and Conservation Act, Act of June 27, 1947 (P.L. 1095, No.___), as amended, 52 P.S. 681.1 et seq.

(Related to control and drainage of water from coal formations), Act of July 7, 1955 (P.L. 258, No.___), as amended, 53 P.S. 682 et seq.

(Related to Anthracite Mine Drainage), Act of July 7, 1955 (P.L. 258), 52 P.S. 687 et seq.

PA Bituminous Coal Mine Act, Act of July 17, 1961 (P.L. 659, No.___), as amended, 52 P.S. 701-101 et seq.

Related to Abandoned Mines), Act of May 7, 1935 (P.L. 141, No.___), as amended, 52 P.S. 809 et seq.

(Related to maps and plans), Act of June 15, 1911 (P.L. 954, No.___), as amended, 52 P.S. 823.

Surface Mining Conservation and Reclamation Act, Act of May 31, 1945 (P.L. 1198, No.___), as amended, 52 P.S. 1395.1 et seq. and Department of Environmental Resources Promulgated thereunder.

The Bituminous Mine Subsidence and Land Conservation Act, Act of April 27, 1966 (P.L. 31, 1st Sp. Sess., No.___), 52 P.S. 1406.1 et seq.

(Related to cave-in or subsidence of surface above mines), Act of July 2, 1937 (P.L. 2787, No.___), as amended, 52 P.S. 1407 et seq.

(Related to Coal Striping), Act of June 18, 1941 (P.L. 133 No.__), as amended, 52 P.S. 1471 et seq.

(Related to Coal under State Lands), Act of June 1, 1933 (P.L. 1409, No.___), as amended, 52 P.S. 1501 et seq.

(Related to Mining Safety Zones), Act of December 22, 1959 (P.L. 1994, No.___), as amended, 52 P.S. 3101 et seq.

(Related to Coal Mine Subsidence Insurance Fund), Act of August 23, 1961 (P.L. 1068, No.___), as amended, 52 P.S. 3201 et seq. and regulations promulgated pursuant thereto.

(Related to Emergency Mine Subsidence Relief), Act of November 8, 1971 (P.L. 532, No. 136), as amended, 52 P.S. 3241 et seq.

Interstate Mining Compact, Act of May 5, 1966 (P.L. 40, Sp. Sess. No. 1 No.___), as amended, 52 P.S. 3251 et seq.

Noncoal Surface Mining Conservation and Reclamation Act, Act of December 19, 1984 (P.L. 1093 No. 219), as amended, 52 P.S. 3301 et seq. and regulations promulgated pursuant thereto.

XIII. Purdon's Statutes –Title 58 (Oil and Gas)

Oil and Gas Conservation Law, Act of July 25, 1961 (P.L. 825, No.___), as amended, 58 P.S. 401 et seq. and regulations promulgated pursuant thereto.

PA Used Oil Recycling Act, Act of April 9, 1982 (P.L. 314, No. 89), as amended, 58 P.S. 471 et seq.

Coal and Gas Resource Coordination Act, Act of December 18, 1984 (P.L. 1069, No. 214), as amended, 58 P.S. 501 et seq.

Oil and Gas Act, Act of December 19, 1984 (P.L. 1140, No. 233), as amended, 58 P.S. 601.101 et seq. and regulations promulgated pursuant thereto.

XIV. Purdon's Statutes – Title 61

(Related to creation of Pennsylvania Historical and Museum Commission), Act of June 6, 1945 (P.L. 1398), P.s. 61, 62,70, 104, 142, 158, 716.

XV. Purdon's Statutes – Title 63 (Professions and Occupations)

PA Pesticide Act of 1957 (P.L. 248 (1957)), 63 P.S. 390-9.

Sewage Treatment Plant and Waterworks Operators' Certification Act, Act of November 19, 1968 (P.L. 1052, No. 322), as amended, 63 P.S. 1004 et seq. and Department of Environmental Resources regulations promulgated thereunder.

XVI. Purdon's Statutes – Title 64 (Public Lands)

PA Appalachian Trail Act, Act of April 28, 1978 (P.L. 87, No. 41), as amended, 64 P.S. 801 et seq.

XVII. Purdon's Statutes – Title 71 (State Government)

The Administrative Code of 1929, Act of April 9, 1929 (P.L. 177, No. 175), as amended, 71 P.S. 51 et seq. and Department of Environmental Resources regulations promulgated thereunder.

Historic Preservation Act, Act of November 22, 1978 (P.L. 1160, No. 273), as amended, 71 P.S. 1047.1a et seq.

PA Urban Assistance Act of 1969, Act of March 21, 1970 (P.L. 195), 71 P.S. 1049.101 et seq. and regulations promulgated pursuant thereto.

Commerce Law, Act of May 10, 1939 (P.L. 111), 71 P.S. 1709-1 et seq.

XVIII. Purdon's Statutes – Title 72 (Taxation and Fiscal Affairs)

Project70 Land Acquisition and Borrowing Act, Act of June 22, 1964 (P.L. 131, Sp. Sess., No. 8), as amended, 72 P.S. 3946.1 et seq.

Housing and Redevelopment Assistance Law, Act of May 20, 1949, (P.L. 579), 72 P.S. 5860 612; 5860 701, 5860 703.

(Related to pollution control services), Act of March 4, 1971 (P.L. 6, No. 2), as amended, 72 P.S. 7602.1 et seq.

IXX. Purdon's Statutes – Title 73 (Trade and Commerce)

(Related to Explosives), Act of July 1, 1937 (P.L. 2681, No.___) as amended 73 P.S. 151 et seq.

(Related to Explosives), Act of July 10, 1957 (P.L. 685, No.___), as amended, 73 P.S. 164 et seq.

(Related to Black Powder), Act of May 31, 1975 (P.L. 304, No. 96), as amended, 73 P.S. 169 et seq.

(Related to excavation and demolition), Act of December 10, 1974 (P.L. 852, No. 287)m as amended, 732 P.S. 176 et seq.

Industrial Development Authority Law, Act of May 17 (P.L. 1609, 1957), as amended 73 P.S. 301.

Site Development Act, Act of May 6, 1968 (P.L. ___, No. 61), as amended 73 P.S. 361 et seq.

XX. Purdon's Statutes – Title 75 (Vehicles)

Vehicle Code, Act of June 17, 1976 (P.L. 162, No. 81), as amended, 75 Pa C.S.A. 101 et seq. and regulations promulgated thereto.
Hazardous Substances Transportation Act, Act of November 9, 1965 (P.L. 657), 75 P.S. 240 et seq. and regulations promulgated pursuant thereto.

Snowmobile Law, Act of June 17, 1976 (P.L. 162, No. 81), as amended 75 Pa. C.S.A. 7701 et seq.

(Related to hazardous materials transport), Act of June 30, 1984 (P.L. 473, No. 99), as amended, 75 Pa. C.S.A. 8301 et seq.

XXI. Purdon's Statutes – Title 77 (Workmen's Compensation)

Pa Workmen's Compensation Act, Act of June 21, 1939 (P.L. 1520, No.___), as amended, 77 P.S. 1 et seq.

PA Occupational Disease Act, Act of June 21, 1939 (P.L. 566, No. 284), as amended, 77 P.S. 1201 et seq.

XXII. Other Statutes

Amending Act 484 (August 23, 1961) bringing clay mines within the scope (Subsidence Insurance) of the Act, Act of July 1, 1971.

Regulating snowmobiles, providing registration and fees, and providing penalties, Act of August 12, 1971.

Industrial Park Loans, Act of August 31, 1971.

Act limiting the amount of noise produced by motor vehicles, providing noise testing and fixing penalties, Act of January 26, 1972.

Act regulating vehicle emission systems, Act of June 16, 1972.

(Relating to Medical Waste-Manifesting and Transporter Licensing), Act of July 13, 1988 (P.L.___, No. 93).

Municipal Waste Planning, Recycling and Waste Reduction Act, Act of July 28, 1988 (P.L.___, No. 101).

Hazardous Sites Cleanup Act, Act of October 18, 1988 (P.L.___, No. 108) and Department of Environmental Resources regulations promulgated thereunder.

Appalachian States Low-Level Radioactive Waste Compact. 7125.1 et seq.

PART 2 – PRODUCTS (Not Applicable)

PART 3 –EXECUTION (Not Applicable)

END OF SECTION 00 0800

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IN THE COURT OF COMMON PLEAS
OF MONROE COUNTY, PENNSYLVANIA
CIVIL DIVISION

CONTRACTOR: _____

NO. _____

AND
Monroe County Historical Association

NO-LIEN AGREEMENT

WHEREAS, the parties hereto did on the _____ day of _____, 20__, enter into an agreement (hereinafter the "Contract"), therein and whereby said Contractor undertook and agreed to furnish all materials, labor and equipment, etc., to complete the work for the Alterations & Heritage Center Addition for Monroe County Historical Association located at 900 Main Street, Stroudsburg, PA 18360.

NOW, THEREFORE, the Contractor for itself and any and all subcontractors, materialmen and parties acting for, through or under the Contractor or for, through or under any of them, does covenant and agree that it will not at any time suffer or permit any mechanics' lien or any other lien, attachment or other encumbrance, under any laws, regulations, or orders, Federal, State or local, or otherwise by any person or persons whomsoever, to be put or remain on the building or premises, into or upon which any work is done or labor or materials are furnished under this Contract, for such work, labor or material, or by reason of any other claim or demand against the Contractor, and the Contractor has not obtained absolute title; and the Contractor agrees, further, that any mechanics' lien, materialmen's lien or any other lien, attachment or other encumbrance or claim of a third party, however arising (whether through the Contractor's or Owner's or any other persons action or inaction, and whether valid or invalid), until it is removed shall preclude any and all claim or demand for any payment whatsoever under or by virtue of the Contract, and in the event that same is not removed, the Owner at its discretion may remove same at the expense (including legal fees) of the Contractor, and without regard to the validity or invalidity thereof.

The Contractor expressly agrees further, that no lien shall attach to the real estate, building, structures, or any other improvement to the Owner either on behalf of the Contractor herein or on behalf of any subcontractor, mechanic, journeyman, laborer, materialman or person performing improvement or premises of said Owner, or on behalf of any other person. Neither the Contractor nor any other person supplying any materials, equipment, machinery or other property, or performing work or labor in or upon the building or the work, included in this Contract shall have the right to file a mechanic's lien against the building or premises.

Contractor warrants and represents that at the time of execution hereof no work of any kind has been done and no materials of any kind have been furnished, delivered or ordered in connection with the performance of this Contract of any supplemental contract for extra work.

This stipulation and waiver is made and intended to be filed with the Monroe County Prothonotary within ten (10) days after the date hereof, in accordance with the requirements of Act of Assembly of Pennsylvania, in such case provided.

In WITNESS WHEREOF, we have hereunto set our hands and seals, intending thereby to become legally bound this _____ day of _____, 20____.

OWNER:
Monroe County Historical Association

_____

_____

_____

ATTEST: _____

_____

WITNESS: _____

CONTRACTOR:

By:

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)* Stroud Mansion Heritage Center Expansion Project 900 Main Street Stroudsburg, Pennsylvania 18360	**ARCHITECT'S PROJECT NUMBER:** 16.200 **CONTRACT FOR:** **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Monroe County Historical Association 900 Main Street Stroudsburg, Pennsylvania 18360		

STATE OF: **Pennsylvania**
COUNTY OF: **Monroe**

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☐ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)* Stroud Mansion Heritage Center Expansion Project 900 Main Street Stroudsburg, Pennsylvania 18360	**ARCHITECT'S PROJECT NUMBER:** 16.200 **CONTRACT FOR:** **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Monroe County Historical Association 900 Main Street Stroudsburg, Pennsylvania 18360		

STATE OF: Pennsylvania
COUNTY OF: Monroe

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* Stroud Mansion Heritage Center Expansion Project 900 Main Street Stroudsburg, Pennsylvania 183604	**ARCHITECT'S PROJECT NUMBER:** 16.200 **CONTRACT FOR:** **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Monroe County Historical Association 900 Main Street Stroudsburg, Pennsylvania 183604		

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

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

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

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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SECTION 00 7343 PREVAILING WAGE RATE REQUIREMENTS

1.1 The provisions of the Pennsylvania Prevailing Wage Act, Act. No. 442, approved August 15, 1961 (P.L. 987) as amended are hereby incorporated herein and the Contractor and all Subcontractors shall comply with the requirements of the applicable portions thereof and the Regulations issued in connection therewith.

1.2 Pursuant to the requirements of the above Act, the Prevailing Minimum Wage Predetermination is attached hereto and hereby made part of the Contract Documents.

1.3 All Prime Contractors shall submit (3) copies of weekly certification forms with their payment requisitions. The form to be used is the latest edition of the Department of Labor and Industry form “Contractor’s or Subcontractor’s Weekly Payroll Certification for Public Works Projects” (forms LIPW-123 and LIPW-124).

1.4 There shall be paid each laborer or mechanic of the Contractor or Subcontractor engaged in the Work on this Project, in the trade or occupation listed on the attached Prevailing Minimum Wage Predetermination, not less than the hourly wage rate set opposite the same, regardless of any contractual relationship which may be alleged to exist between the Contractor, or any Subcontractor, and such laborers and mechanics.

1.5 Each Prime Contractor or Subcontractor shall post the general prevailing minimum wage rates for each craft and classification involved, as determined by the Secretary of the Department of Labor and Industry, including the effective date of any changes thereof, in prominent and easily accessible places at the site of the work, or at such place or places as are used by them to pay the workmen their wages.

1.6 Each Prime Contractor or Subcontractor shall keep an accurate record showing the name, craft and the actual hourly rate of wage paid to each workman employed by him and such record shall be preserved for two years from date of payment. The record shall be open at all reasonable hours to the inspection of the public body awarding the contract and to the Secretary of the Department of Labor and Industry.

1.7 Before final payment is made of any sum or sums due on this Project, all Contractors and Subcontractors shall file statements, in writing, in a form satisfactory to the Secretary of the Department of Labor and Industry, certifying to the amounts then due and owing from such Contractor of Subcontractor filing such to any or all workmen for wages due to each respectively, which statement shall be verified by the oath of the Contractor or Subcontractor as the case may be, that he has read such statement subscribed by him, knows the contents thereof, and that the same is true of his own knowledge; provided, nevertheless, that nothing contained herein shall impair the right of a Contractor to receive final payment because of the failure of any Subcontractor to comply with the provisions of Act No. 442, effective February 1, 1961, as amended by Act No. 342, approved August 9, 1963.

1.8 Any Contractor or Subcontractor who shall, under oath, verify the statement required to be filed as indicated above, which is known to him to be false, shall be guilty of a misdemeanor, and shall, upon conviction, be sentenced to pay a fine of not exceeding two thousand five hundred dollars ($2,500.00) or to undergo imprisonment not

exceeding five (5) years, or both.

END OF SECTION 00 7343

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project Name:	Monroe County Historical Association, Alteration & Heritage Center Addition
Awarding Agency:	Monroe County Historical Association
Contract Award Date:	4/17/2023
Serial Number:	23-00525
Project Classification:	Building
Determination Date:	1/19/2023
Assigned Field Office:	Scranton
Field Office Phone Number:	(570)963-4577
Toll Free Phone Number:	(877)214-3962
Project County:	Monroe County

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Asbestos & Insulation Workers	7/1/2021		$34.58	$20.67	$55.25
Asbestos & Insulation Workers	7/1/2022		$35.83	$20.67	$56.50
Boilermaker (Commercial, Institutional, and Minor Repair Work)	1/1/2019		$29.26	$18.48	$47.74
Boilermakers	1/1/2021		$49.32	$34.90	$84.22
Boilermakers	1/1/2022		$50.17	$35.30	$85.47
Boilermakers	1/1/2023		$51.27	$35.30	$86.57
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/2/2021		$35.19	$19.27	$54.46
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2022		$36.94	$19.67	$56.61
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	4/30/2023		$38.84	$19.67	$58.51
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	4/28/2024		$40.69	$19.67	$60.36
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/4/2025		$42.54	$19.67	$62.21
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	5/1/2021		$31.78	$18.63	$50.41
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	5/1/2022		$32.88	$18.63	$51.51
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	5/1/2023		$34.03	$18.63	$52.66
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	5/1/2024		$35.23	$18.63	$53.86
Cement Finishers & Plasterers	5/2/2021		$28.03	$21.05	$49.08
Cement Finishers & Plasterers	6/1/2022		$37.06	$13.50	$50.56
Cement Masons	6/1/2021		$35.88	$13.50	$49.38
Cement Masons	6/1/2022		$36.48	$14.00	$50.48
Drywall Finisher	5/1/2021		$29.58	$21.57	$51.15
Drywall Finisher	5/1/2022		$30.71	$22.36	$53.07
Electricians	6/1/2021		$59.02	$35.11	$94.13
Electricians	5/30/2022		$60.27	$37.06	$97.33
Electricians	5/29/2023		$61.87	$38.66	$100.53
Electricians	6/3/2024		$63.38	$40.25	$103.63
Elevator Constructor	1/1/2018		$47.48	$33.00	$80.48
Glazier	5/1/2021		$35.53	$22.86	$58.39
Glazier	5/1/2022		$37.71	$22.08	$59.79
Glazier	5/1/2023		$37.71	$23.68	$61.39
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	7/1/2021		$34.01	$31.13	$65.14
Laborers (Class 01 - See notes)	5/1/2021		$28.84	$18.49	$47.33
Laborers (Class 01 - See notes)	5/1/2022		$29.89	$18.49	$48.38
Laborers (Class 02 - See notes)	5/1/2021		$29.87	$18.49	$48.36
Laborers (Class 02 - See notes)	5/1/2022		$30.92	$18.49	$49.41
Laborers (Class 03 - See notes)	5/2/2021		$29.59	$18.58	$48.17
Laborers (Class 03 - See notes)	5/1/2022		$30.54	$18.58	$49.12
Laborers (Class 03 - See notes)	4/30/2023		$31.14	$19.18	$50.32

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Laborers (Class 04 - See notes)	5/2/2021		$31.09	$18.58	$49.67
Laborers (Class 04 - See notes)	5/1/2022		$32.04	$18.58	$50.62
Laborers (Class 04 - See notes)	4/30/2023		$32.64	$19.18	$51.82
Laborers (Class 05 - See notes)	5/2/2021		$31.59	$18.58	$50.17
Laborers (Class 05 - See notes)	5/1/2022		$32.54	$18.58	$51.12
Laborers (Class 05 - See notes)	4/30/2023		$33.14	$19.18	$52.32
Laborers (Class 06 - See notes)	5/1/2021		$30.84	$18.49	$49.33
Laborers (Class 06 - See notes)	5/1/2022		$31.89	$18.49	$50.38
Marble Mason	5/1/2021		$31.82	$18.89	$50.71
Marble Mason	5/1/2022		$33.12	$19.29	$52.41
Marble Mason	5/1/2023		$35.07	$19.29	$54.36
Marble Mason	5/1/2024		$37.02	$19.29	$56.31
Marble Mason	5/1/2025		$38.97	$19.29	$58.26
Millwright	5/1/2020		$36.04	$19.31	$55.35
Operators (Building, Class 01 - See Notes)	5/1/2021		$39.87	$27.94	$67.81
Operators (Building, Class 01 - See Notes)	5/1/2022		$41.41	$28.40	$69.81
Operators (Building, Class 01 - See Notes)	5/1/2023		$42.57	$29.24	$71.81
Operators (Building, Class 01A - See Notes)	5/1/2021		$42.12	$28.60	$70.72
Operators (Building, Class 01A - See Notes)	5/1/2022		$43.66	$29.06	$72.72
Operators (Building, Class 01A - See Notes)	5/1/2023		$44.82	$29.90	$74.72
Operators (Building, Class 02 - See Notes)	5/1/2021		$39.59	$27.85	$67.44
Operators (Building, Class 02 - See Notes)	5/1/2022		$41.13	$28.31	$69.44
Operators (Building, Class 02 - See Notes)	5/1/2023		$42.29	$29.15	$71.44
Operators (Building, Class 02A - See Notes)	5/1/2021		$41.84	$28.52	$70.36
Operators (Building, Class 02A - See Notes)	5/1/2022		$43.38	$28.98	$72.36
Operators (Building, Class 02A - See Notes)	5/1/2023		$44.54	$29.82	$74.36
Operators (Building, Class 03 - See Notes)	5/1/2021		$36.87	$27.04	$63.91
Operators (Building, Class 03 - See Notes)	5/1/2022		$38.41	$27.50	$65.91
Operators (Building, Class 03 - See Notes)	5/1/2023		$39.57	$28.34	$67.91
Operators (Building, Class 04 - See Notes)	5/1/2021		$35.72	$26.72	$62.44
Operators (Building, Class 04 - See Notes)	5/1/2022		$37.27	$27.17	$64.44
Operators (Building, Class 04 - See Notes)	5/1/2023		$38.42	$28.02	$66.44
Operators (Building, Class 05 - See Notes)	5/1/2021		$35.27	$26.59	$61.86
Operators (Building, Class 05 - See Notes)	5/1/2022		$36.82	$27.04	$63.86
Operators (Building, Class 05 - See Notes)	5/1/2023		$37.97	$27.89	$65.86
Operators (Building, Class 06 - See Notes)	5/1/2021		$34.40	$26.32	$60.72
Operators (Building, Class 06 - See Notes)	5/1/2022		$35.95	$26.77	$62.72
Operators (Building, Class 06 - See Notes)	5/1/2023		$37.10	$27.62	$64.72
Operators (Building, Class 07A- See Notes)	5/1/2021		$48.31	$31.86	$80.17
Operators (Building, Class 07A- See Notes)	5/1/2022		$50.17	$32.40	$82.57
Operators (Building, Class 07A- See Notes)	5/1/2023		$51.63	$33.34	$84.97
Operators (Building, Class 07B- See Notes)	5/1/2021		$47.96	$31.77	$79.73
Operators (Building, Class 07B- See Notes)	5/1/2022		$49.81	$32.31	$82.12
Operators (Building, Class 07B- See Notes)	5/1/2023		$51.28	$33.24	$84.52

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Painters Class 1 (see notes)	5/1/2021		$29.02	$21.57	$50.59
Painters Class 1 (see notes)	5/1/2022		$29.65	$22.36	$52.01
Painters Class 2 (see notes)	5/1/2021		$31.92	$21.57	$53.49
Painters Class 2 (see notes)	5/1/2022		$33.05	$22.36	$55.41
Painters Class 3 (see notes)	5/1/2021		$38.02	$21.57	$59.59
Painters Class 3 (see notes)	5/1/2022		$39.40	$22.36	$61.76
Pile Driver Divers (Building, Heavy, Highway)	1/1/2021		$54.75	$20.10	$74.85
Pile Driver Divers (Building, Heavy, Highway)	1/1/2022		$56.40	$20.50	$76.90
Piledrivers	1/1/2021		$36.50	$20.10	$56.60
Piledrivers	1/1/2022		$37.60	$20.50	$58.10
Plasterers	6/1/2021		$36.46	$13.00	$49.46
Plumbers and Steamfitters	12/1/2021		$46.24	$22.07	$68.31
Plumbers and Steamfitters	12/1/2022		$47.74	$22.32	$70.06
Roofers (Composition)	5/1/2021		$40.33	$33.12	$73.45
Roofers (Composition)	5/1/2022		$41.48	$33.87	$75.35
Roofers (Shingle)	5/1/2020		$29.50	$21.25	$50.75
Roofers (Shingle, Slate, Tile)	5/1/2018		$27.50	$20.37	$47.87
Roofers (Slate & Tile)	5/1/2020		$32.50	$21.25	$53.75
Sheet Metal Workers	5/1/2021		$31.60	$27.26	$58.86
Sheet Metal Workers	5/1/2022		$33.62	$28.24	$61.86
Sign Makers and Hangars	7/17/2021		$29.49	$23.90	$53.39
Sign Makers and Hangars	7/15/2022		$30.54	$24.35	$54.89
Sprinklerfitters	4/1/2021		$40.33	$26.94	$67.27
Sprinklerfitters	4/1/2022		$42.29	$27.48	$69.77
Terrazzo Finisher	5/1/2022		$34.46	$19.24	$53.70
Terrazzo Finisher	5/1/2023		$35.79	$19.25	$55.04
Terrazzo Finisher	5/1/2024		$37.16	$19.26	$56.42
Terrazzo Grinder	5/1/2022		$35.19	$19.24	$54.43
Terrazzo Grinder	5/1/2023		$36.54	$19.25	$55.79
Terrazzo Grinder	5/1/2024		$37.92	$19.26	$57.18
Terrazzo Mechanics	5/1/2022		$35.12	$20.99	$56.11
Terrazzo Mechanics	5/1/2023		$36.51	$21.00	$57.51
Terrazzo Mechanics	5/1/2024		$37.94	$21.01	$58.95
Terrazzo Setter	5/1/2019		$31.81	$19.67	$51.48
Tile & Marble Finisher	5/1/2021		$28.90	$16.19	$45.09
Tile & Marble Finisher	5/1/2022		$30.20	$16.59	$46.79
Tile & Marble Finisher	5/1/2023		$32.15	$16.59	$48.74
Tile & Marble Finisher	5/1/2024		$34.10	$16.59	$50.69
Tile & Marble Finisher	5/1/2025		$36.05	$16.59	$52.64
Tile Setter	5/1/2021		$31.62	$19.09	$50.71
Tile Setter	5/1/2022		$33.12	$19.29	$52.41
Tile Setter	5/1/2023		$35.07	$19.29	$54.36
Tile Setter	5/1/2024		$37.02	$19.29	$56.31
Tile Setter	5/1/2025		$38.97	$19.29	$58.26

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Truckdriver class 1(see notes)	5/1/2021		$37.72	$0.00	$37.72
Truckdriver class 2 (see notes)	5/1/2021		$37.79	$0.00	$37.79
Truckdriver class 3 (see notes)	5/1/2021		$38.28	$0.00	$38.28
Window Film / Tint Installer	6/1/2019		$24.52	$12.08	$36.60

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Carpenter	5/1/2022		$34.02	$18.39	$52.41
Carpenter and Piledriver	5/1/2021		$33.12	$17.74	$50.86
Cement Finishers	6/1/2016		$32.43	$11.35	$43.78
Electric Lineman	1/1/2018		$55.43	$22.48	$77.91
Electric Lineman	8/29/2022		$62.66	$28.08	$90.74
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	7/1/2021		$34.01	$31.13	$65.14
Laborers (Class 01 - See notes)	5/1/2021		$23.21	$18.09	$41.30
Laborers (Class 01 - See notes)	5/1/2022		$24.01	$18.54	$42.55
Laborers (Class 01 - See notes)	5/1/2023		$24.81	$18.99	$43.80
Laborers (Class 01 - See notes)	5/1/2024		$25.61	$19.49	$45.10
Laborers (Class 02 - See notes)	5/1/2021		$29.83	$18.09	$47.92
Laborers (Class 02 - See notes)	5/1/2022		$30.63	$18.54	$49.17
Laborers (Class 02 - See notes)	5/1/2023		$31.43	$18.99	$50.42
Laborers (Class 02 - See notes)	5/1/2024		$32.23	$19.49	$51.72
Laborers (Class 03 - See notes)	5/1/2021		$26.82	$18.09	$44.91
Laborers (Class 03 - See notes)	5/1/2022		$27.62	$18.54	$46.16
Laborers (Class 03 - See notes)	5/1/2023		$28.42	$18.99	$47.41
Laborers (Class 03 - See notes)	5/1/2024		$29.22	$19.49	$48.71
Laborers (Class 04 - See notes)	5/1/2021		$27.17	$18.09	$45.26
Laborers (Class 04 - See notes)	5/1/2022		$27.97	$18.54	$46.51
Laborers (Class 04 - See notes)	5/1/2023		$28.77	$18.99	$47.76
Laborers (Class 04 - See notes)	5/1/2024		$29.57	$19.49	$49.06
Laborers (Class 05 - See notes)	5/1/2021		$27.84	$18.09	$45.93
Laborers (Class 05 - See notes)	5/1/2022		$28.64	$18.54	$47.18
Laborers (Class 05 - See notes)	5/1/2023		$29.44	$18.99	$48.43
Laborers (Class 05 - See notes)	5/1/2024		$30.24	$19.49	$49.73
Laborers (Class 06 - See notes)	5/1/2021		$27.26	$18.09	$45.35
Laborers (Class 06 - See notes)	5/1/2022		$28.06	$18.54	$46.60
Laborers (Class 06 - See notes)	5/1/2023		$28.86	$18.99	$47.85
Laborers (Class 06 - See notes)	5/1/2024		$29.66	$19.49	$49.15
Laborers (Class 07 - See notes)	5/1/2021		$27.55	$18.09	$45.64
Laborers (Class 07 - See notes)	5/1/2022		$28.35	$18.54	$46.89
Laborers (Class 07 - See notes)	5/1/2023		$29.15	$18.99	$48.14
Laborers (Class 07 - See notes)	5/1/2024		$29.95	$19.49	$49.44
Laborers (Class 08 - See notes)	5/1/2021		$28.03	$18.09	$46.12
Laborers (Class 08 - See notes)	5/1/2022		$28.83	$18.54	$47.37
Laborers (Class 08 - See notes)	5/1/2023		$29.63	$18.99	$48.62
Laborers (Class 08 - See notes)	5/1/2024		$30.43	$19.49	$49.92
Operators (Heavy, Class 01 - See Notes)	5/1/2021		$38.44	$27.52	$65.96
Operators (Heavy, Class 01 - See Notes)	5/1/2022		$39.98	$27.98	$67.96
Operators (Heavy, Class 01 - See Notes)	5/1/2023		$41.14	$28.82	$69.96
Operators (Heavy, Class 01 - See Notes)	5/1/2024		$42.30	$29.66	$71.96
Operators (Heavy, Class 01 - See Notes)	5/1/2025		$43.46	$30.50	$73.96
Operators (Heavy, Class 01 - See Notes)	5/1/2026		$44.61	$31.35	$75.96

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Heavy, Class 01A - See Notes)	5/1/2021		$40.69	$28.18	$68.87
Operators (Heavy, Class 01A - See Notes)	5/1/2022		$42.23	$28.64	$70.87
Operators (Heavy, Class 01A - See Notes)	5/1/2023		$43.39	$29.48	$72.87
Operators (Heavy, Class 01A - See Notes)	5/1/2024		$44.55	$30.32	$74.87
Operators (Heavy, Class 01A - See Notes)	5/1/2025		$45.71	$31.16	$76.87
Operators (Heavy, Class 01A - See Notes)	5/1/2026		$46.86	$32.01	$78.87
Operators (Heavy, Class 02 - See Notes)	5/1/2021		$38.16	$27.43	$65.59
Operators (Heavy, Class 02 - See Notes)	5/1/2022		$39.70	$27.89	$67.59
Operators (Heavy, Class 02 - See Notes)	5/1/2023		$40.86	$28.73	$69.59
Operators (Heavy, Class 02 - See Notes)	5/1/2024		$42.02	$29.57	$71.59
Operators (Heavy, Class 02 - See Notes)	5/1/2025		$43.18	$30.41	$73.59
Operators (Heavy, Class 02 - See Notes)	5/1/2026		$44.34	$31.25	$75.59
Operators (Heavy, Class 02A - See Notes)	5/1/2021		$40.41	$28.10	$68.51
Operators (Heavy, Class 02A - See Notes)	5/1/2022		$41.95	$28.56	$70.51
Operators (Heavy, Class 02A - See Notes)	5/1/2023		$43.11	$29.40	$72.51
Operators (Heavy, Class 02A - See Notes)	5/1/2024		$44.27	$30.24	$74.51
Operators (Heavy, Class 02A - See Notes)	5/1/2025		$45.43	$31.08	$76.51
Operators (Heavy, Class 02A - See Notes)	5/1/2026		$46.59	$31.92	$78.51
Operators (Heavy, Class 03 - See Notes)	5/1/2021		$35.24	$26.57	$61.81
Operators (Heavy, Class 03 - See Notes)	5/1/2022		$36.78	$27.03	$63.81
Operators (Heavy, Class 03 - See Notes)	5/1/2023		$37.95	$27.86	$65.81
Operators (Heavy, Class 03 - See Notes)	5/1/2024		$39.11	$28.70	$67.81
Operators (Heavy, Class 03 - See Notes)	5/1/2025		$40.26	$29.55	$69.81
Operators (Heavy, Class 03 - See Notes)	5/1/2026		$41.43	$30.38	$71.81
Operators (Heavy, Class 04 - See Notes)	5/1/2021		$34.10	$26.24	$60.34
Operators (Heavy, Class 04 - See Notes)	5/1/2022		$35.65	$26.69	$62.34
Operators (Heavy, Class 04 - See Notes)	5/1/2023		$36.80	$27.54	$64.34
Operators (Heavy, Class 04 - See Notes)	5/1/2024		$37.96	$28.38	$66.34
Operators (Heavy, Class 04 - See Notes)	5/1/2025		$39.12	$29.22	$68.34
Operators (Heavy, Class 04 - See Notes)	5/1/2026		$40.28	$30.06	$70.34
Operators (Heavy, Class 05 - See Notes)	5/1/2021		$33.65	$26.11	$59.76
Operators (Heavy, Class 05 - See Notes)	5/1/2022		$35.20	$26.56	$61.76
Operators (Heavy, Class 05 - See Notes)	5/1/2023		$36.35	$27.41	$63.76
Operators (Heavy, Class 05 - See Notes)	5/1/2024		$37.51	$28.25	$65.76
Operators (Heavy, Class 05 - See Notes)	5/1/2025		$38.67	$29.09	$67.76
Operators (Heavy, Class 05 - See Notes)	5/1/2026		$39.83	$29.93	$69.76
Operators (Heavy, Class 06 - See Notes)	5/1/2021		$32.77	$25.84	$58.61
Operators (Heavy, Class 06 - See Notes)	5/1/2022		$34.31	$26.31	$60.62
Operators (Heavy, Class 06 - See Notes)	5/1/2023		$35.48	$27.14	$62.62
Operators (Heavy, Class 06 - See Notes)	5/1/2024		$36.64	$27.98	$64.62
Operators (Heavy, Class 06 - See Notes)	5/1/2025		$37.80	$28.82	$66.62
Operators (Heavy, Class 06 - See Notes)	5/1/2026		$38.96	$29.66	$68.62
Operators (Heavy, Class 07A - See Notes)	5/1/2021		$46.59	$31.37	$77.96
Operators (Heavy, Class 07A - See Notes)	5/1/2022		$48.45	$31.91	$80.36

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Heavy, Class 07A - See Notes)	5/1/2023		$49.93	$32.83	$82.76
Operators (Heavy, Class 07A - See Notes)	5/1/2024		$51.39	$33.77	$85.16
Operators (Heavy, Class 07A - See Notes)	5/1/2025		$52.85	$34.71	$87.56
Operators (Heavy, Class 07A - See Notes)	5/1/2026		$54.32	$35.64	$89.96
Operators (Heavy, Class 07B - See Notes)	5/1/2021		$46.25	$31.26	$77.51
Operators (Heavy, Class 07B - See Notes)	5/1/2022		$48.10	$31.81	$79.91
Operators (Heavy, Class 07B - See Notes)	5/1/2023		$49.58	$32.73	$82.31
Operators (Heavy, Class 07B - See Notes)	5/1/2024		$51.04	$33.67	$84.71
Operators (Heavy, Class 07B - See Notes)	5/1/2025		$52.51	$34.60	$87.11
Operators (Heavy, Class 07B - See Notes)	5/1/2026		$53.97	$35.54	$89.51
Operators (Highway, Class 01 - See Notes)	5/1/2021		$39.10	$25.70	$64.80
Operators (Highway, Class 01 - See Notes)	5/1/2022		$39.10	$27.70	$66.80
Operators (Highway, Class 01 - See Notes)	5/1/2023		$40.25	$28.55	$68.80
Operators (Highway, Class 01 - See Notes)	5/1/2024		$41.41	$29.39	$70.80
Operators (Highway, Class 01 - See Notes)	5/1/2025		$42.56	$30.24	$72.80
Operators (Highway, Class 01 - See Notes)	5/1/2026		$43.72	$31.08	$74.80
Operators (Highway, Class 01a - See Notes)	5/1/2021		$41.35	$26.38	$67.73
Operators (Highway, Class 01a - See Notes)	5/1/2022		$41.35	$28.38	$69.73
Operators (Highway, Class 01a - See Notes)	5/1/2023		$42.50	$29.23	$71.73
Operators (Highway, Class 01a - See Notes)	5/1/2024		$43.66	$30.07	$73.73
Operators (Highway, Class 01a - See Notes)	5/1/2025		$44.81	$30.92	$75.73
Operators (Highway, Class 01a - See Notes)	5/1/2026		$45.97	$31.76	$77.73
Operators (Highway, Class 02 - See Notes)	5/1/2021		$37.93	$25.35	$63.28
Operators (Highway, Class 02 - See Notes)	5/1/2022		$37.93	$27.35	$65.28
Operators (Highway, Class 02 - See Notes)	5/1/2023		$39.08	$28.20	$67.28
Operators (Highway, Class 02 - See Notes)	5/1/2024		$40.24	$29.04	$69.28
Operators (Highway, Class 02 - See Notes)	5/1/2025		$41.39	$29.89	$71.28
Operators (Highway, Class 02 - See Notes)	5/1/2026		$42.55	$30.73	$73.28
Operators (Highway, Class 03 - See Notes)	5/1/2021		$37.23	$25.16	$62.39
Operators (Highway, Class 03 - See Notes)	5/1/2022		$37.23	$27.15	$64.38
Operators (Highway, Class 03 - See Notes)	5/1/2023		$38.39	$27.99	$66.38
Operators (Highway, Class 03 - See Notes)	5/1/2024		$39.55	$28.83	$68.38
Operators (Highway, Class 03 - See Notes)	5/1/2025		$40.70	$29.68	$70.38
Operators (Highway, Class 03 - See Notes)	5/1/2026		$41.87	$30.51	$72.38
Operators (Highway, Class 04 - See Notes)	5/1/2021		$36.77	$25.03	$61.80
Operators (Highway, Class 04 - See Notes)	5/1/2022		$36.77	$27.03	$63.80
Operators (Highway, Class 04 - See Notes)	5/1/2023		$37.94	$27.86	$65.80
Operators (Highway, Class 04 - See Notes)	5/1/2024		$39.10	$28.70	$67.80
Operators (Highway, Class 04 - See Notes)	5/1/2025		$40.26	$29.54	$69.80
Operators (Highway, Class 04 - See Notes)	5/1/2026		$41.41	$30.39	$71.80
Operators (Highway, Class 05 - See Notes)	5/1/2021		$36.26	$24.87	$61.13
Operators (Highway, Class 05 - See Notes)	5/1/2022		$36.26	$26.88	$63.14
Operators (Highway, Class 05 - See Notes)	5/1/2023		$37.42	$27.72	$65.14
Operators (Highway, Class 05 - See Notes)	5/1/2024		$38.58	$28.56	$67.14

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 23-00525 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Operators (Highway, Class 05 - See Notes)	5/1/2025		$39.73	$29.41	$69.14
Operators (Highway, Class 05 - See Notes)	5/1/2026		$40.89	$30.25	$71.14
Operators (Highway, Class 06 - See Notes)	5/1/2021		$39.33	$25.78	$65.11
Operators (Highway, Class 06 - See Notes)	5/1/2022		$39.33	$27.77	$67.10
Operators (Highway, Class 06 - See Notes)	5/1/2023		$40.48	$28.62	$69.10
Operators (Highway, Class 06 - See Notes)	5/1/2024		$41.64	$29.46	$71.10
Operators (Highway, Class 06 - See Notes)	5/1/2025		$42.80	$30.30	$73.10
Operators (Highway, Class 06 - See Notes)	5/1/2026		$43.95	$31.15	$75.10
Operators (Highway, Class 06/A - See Notes)	5/1/2021		$41.58	$26.43	$68.01
Operators (Highway, Class 06/A - See Notes)	5/1/2022		$41.58	$28.43	$70.01
Operators (Highway, Class 06/A - See Notes)	5/1/2023		$42.73	$29.28	$72.01
Operators (Highway, Class 06/A - See Notes)	5/1/2024		$43.89	$30.12	$74.01
Operators (Highway, Class 06/A - See Notes)	5/1/2025		$45.05	$30.96	$76.01
Operators (Highway, Class 06/A - See Notes)	5/1/2026		$46.21	$31.80	$78.01
Operators (Highway, Class 07/A - See Notes)	5/1/2021		$47.08	$29.49	$76.57
Operators (Highway, Class 07/A - See Notes)	5/1/2022		$47.38	$31.59	$78.97
Operators (Highway, Class 07/A - See Notes)	5/1/2023		$48.86	$32.51	$81.37
Operators (Highway, Class 07/A - See Notes)	5/1/2024		$50.32	$33.45	$83.77
Operators (Highway, Class 07/A - See Notes)	5/1/2025		$51.79	$34.38	$86.17
Operators (Highway, Class 07/A - See Notes)	5/1/2026		$53.25	$35.32	$88.57
Operators (Highway, Class 07/B - See Notes)	5/1/2021		$45.66	$29.08	$74.74
Operators (Highway, Class 07/B - See Notes)	5/1/2022		$45.97	$31.17	$77.14
Operators (Highway, Class 07/B - See Notes)	5/1/2023		$47.44	$32.10	$79.54
Operators (Highway, Class 07/B - See Notes)	5/1/2024		$48.91	$33.03	$81.94
Operators (Highway, Class 07/B - See Notes)	5/1/2025		$50.37	$33.97	$84.34
Operators (Highway, Class 07/B - See Notes)	5/1/2026		$51.84	$34.90	$86.74
Painters Class 2 (see notes)	5/1/2020		$31.53	$20.71	$52.24
Painters Class 3 (see notes)	5/1/2020		$37.63	$20.71	$58.34
Pile Driver Divers (Building, Heavy, Highway)	1/1/2021		$54.75	$20.10	$74.85
Pile Driver Divers (Building, Heavy, Highway)	1/1/2022		$56.40	$20.50	$76.90
Piledrivers	5/1/2021		$33.12	$17.74	$50.86
Piledrivers	5/1/2022		$34.02	$18.39	$52.41
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2022		$48.43	$40.28	$88.71
Truckdriver class 1(see notes)	5/1/2021		$37.72	$0.00	$37.72
Truckdriver class 2 (see notes)	5/1/2021		$37.79	$0.00	$37.79
Truckdriver class 3 (see notes)	5/1/2021		$38.28	$0.00	$38.28

SECTION 00 8000 – PA EMPLOYMENT VERIFICATION COMPLIANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contractors and all sub-contractors performing work on all Pennsylvania public work projects.

1. The contractor shall comply with the Commonwealth of Pennsylvania enacted Act 127 of 2012, known as the Public Works Employment Verification Act ('the Act') which requires all public work contractors and subcontractors to utilize the Federal Government's E-Verify system to ensure that all employees performing work on public work projects are authorized to work in the United States.
2. Contractor is required to submit verification as a precondition to the awarding of the Contract.

1.3 DEFINITIONS

A. "Public Work" is defined by the Pennsylvania Department of General Services as the construction, reconstruction, demolition, alteration and/or repair work other than maintenance work, done under contract and paid for in whole or in part out of the funds of a public body where the estimated cost of the total project is in excess of twenty-five thousand dollars ($25,000) but shall not include work performed under a rehabilitation or manpower training programs.

1.4 PROCEDURES

A. Internet verification can be done at website of the U. S. Department of Homeland Security: www.uscis.gov/E-Verify
1. Questions may be addressed to the Pennsylvania Department of General Services at:

Pennsylvania Department of General Services
Employment Verification Compliance Office
Room 105 Tent Bldg.
18th & Herr Streets
Harrisburg, PA 17125
Phone: 717-214-3668
Fax: 7171-214-3669

Website:
http://www.portal.state.pa.us/portal/server.pt/community/construction_and_public_works/1235/public_works_employment_verification/1357211

B. Failure to comply will prevent awarding of the Contract.
   1. Violation of this Act 127 of 2012 will result in additional penalties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 0801

PUBLIC WORK EMPLOYMENT VERIFICATION ACT

General. In accordance with Act 127 of 2012, known as the Public Works Employment Verification Act ("the Act"), effective January 1, 2013, 43 P.S. §§167.1-167.11, use the Federal Government's E-Verify system to ensure that all employees performing work on the project, including subcontractor's employees, are authorized to work in the United States.

Verification Form. Verify the employment eligibility of each new employee hired after January 1, 2013 and submit the Commonwealth Public Works Employment Verification Form ("Form") included in the bid package attachments to the Department.

Contractor. Fax the Form, signed by authorized representative of the Contractor, possessing sufficient knowledge to make the representations and certifications in the Form to Contract Awards at 717-705-1504 within 7 days of the bid opening. Failure or refusal to provide the Form will be considered a refusal to comply with bidding requirements, will result in rejection of the bid, and will be subject to the enforcement activities, sanctions and civil penalties specified in the Act.

Subcontractor. Obtain a signed Form from every subcontractor performing work on the project, signed by authorized representative of the subcontractor, possessing sufficient knowledge to make the representations and certifications in the Form and submit it to the Representative when requesting subcontractor approval. Failure or refusal to provide the Form will be considered a refusal to comply with subcontractor approval requirements, will result in rejection of the subcontractor request, and will subject the subcontractor to the enforcement activities, sanctions and civil penalties specified in the Act.

Include information about the requirements of the Act in all the subcontracts.

The Department of General Services is the Commonwealth agency responsible for enforcement and administration of the Act. Please direct questions about the Act to:

Department of General Services Public Works
Employment Verification Compliance Office
Room 105 Tent Building
18th and Herr Streets
Harrisburg, PA 17125
Fax: 717-214-3669

COMMONWEALTH OF PENNSYLVANIA

PUBLIC WORKS EMPLOYMENT VERIFICATION FORM

Date _____

Business or Organization Name (Employer)_____

Address _____

City _____ **State**_____ **Zip Code** _____

☐ **Contractor** ☐ {dzōŏ2yúNl-ŏű2N óŏKŜŏ] 2yŜú

Contracting Public Body _____

Contract/Project No _____

Project Description _____

Project Location _____

As a contractor/subcontractor for the above referenced public works contract, I hereby affirm that as of the above date, our company is in compliance with the Public Works Employment Verification Act ('the Act') through utilization of the federal E-Verify Program (EVP) operated by the United States Department of Homeland Security. To the best of my/our knowledge, all employees hired post January 1, 2013 are authorized to work in the United States.

It is also agreed to that all public works contractors/subcontractors will utilize the federal EVP to verify the employment eligibility of each new hire within five (5) business days of the employee start date throughout the duration of the public works contract. Documentation confirming the use of the federal EVP upon each new hire shall be maintained in the event of an investigation or audit.

I, _____, authorized representative of the company above, attest that the information contained in this verification form is true and correct and understand that the submission of false or misleading information in connection with the above verification shall be subject to sanctions provided by law.

_____

Authorized Representative Signature

E-VERIFY ACKNOWLEDGMENT

A separate and complete Verification Form required by the Public Works Employment Verification Act, Act No. 127, July 5, 2012 (formerly Senate Bill 637) for itself and each of the proposed Subcontractors (as such term is defined therein) acknowledging its responsibilities and its compliance with the Public Works Employment Verification Act as a precondition of the Owner's Award of the Contract. The Verification Form shall be obtained from the Secretary of the Pennsylvania Department of General Services and shall include a certification that the information is true and correct, subject to sanctions provided by law. The respective Verification Form shall be executed by a representative who has sufficient knowledge and authority to make the representations and certifications contained in the Verification Form.

We hereby certify that if we are selected as the successful bidder, we will provide upon execution of a contract, a copy of the verification form provided by the Department of General Services indicating that the contractor checked the status of all new employees on behalf of itself and each of its Subcontractors and they are legally permitted to work in the United States.

This form must be signed and returned with bid proposals.

Vendor Name: _____

Signed: _____

Printed Name: _____

Title: _____

Date: _____

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DOCUMENT 00 8020 – RACP & LSA GRANT INFORMATION

1.1 REDEVELOPMENT ASSISTANCE CAPITAL PROGRAM (RACP) GRANT INFORMATION

A. The Redevelopment Assistance Capital Program (RACP) is a Commonwealth grant program administered by the Office of the Budget for the acquisition and construction of regional economic, cultural, civic, recreational, and historical improvement projects. RACP projects are authorized in the Redevelopment Assistance section of a Capital Budget Itemization Act, have a regional or multi-jurisdictional impact, and generate substantial increases or maintain current levels of employment, tax revenues, or other measures of economic activity. RACP projects are state-funded projects that cannot obtain primary funding under other state programs.

B. The following document with its referenced attachments is part of the requirements of the Redevelopment Assistance Capital Program Grant. They are made available for Bidders' convenience and information but are not a warranty of all requirements. It is the Contractor's responsibility to obtain all necessary current documents and follow the necessary protocol.

1.2 LOCAL SHARE ACCOUNT (LSA) GRANT INFORMATION

A. The following document with its referenced attachments is part of the requirements of the Local Share Account grant. They are available for Bidders' convenience and information but are not a warranty of all requirements. It is the Contractor's responsibility to obtain all necessary current documents and follow the necessary protocol.

END OF DOCUMENT 00 8020

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KEY COMPLIANCE GUIDELINES

It is suggested that a copy of this complete document be given to your Project, Construction Manager, and/or Architect so that they are fully aware of the RACP requirements related to each. This document should be included in your bid packages, and should be made an addendum to any and all construction contracts, plans and specifications related to the RACP project.

Compliance with all RACP requirements, including the key items in these guidelines will be monitored frequently throughout the construction phase of your project and will be reviewed once more during the legislatively mandated close-out audit.

COMPETITIVE BIDDING REQUIREMENTS

The sole and exclusive bidding requirement for RACP projects is in the Capital Facilities Debt Enabling Act (Act 67 of 2004), which states "Notwithstanding any other provision of law, the solicitation of a minimum of three written bids for all contracted construction work on redevelopment assistance capital projects shall be the sole requirement for the composition, solicitation, opening and award of bids on such projects." Unless the terms of the law change, the Office of the Budget cannot grant waivers for bidding requirements to Grantees.

RACP projects are not subject to separation of trades. You are REQUIRED to solicit a minimum of three (3) bids for "all generally contracted work" being performed within the RACP defined scope of work. You are not required to receive three (3) bid responses. However, you should provide documentation to prove that at least three bids were solicited by providing copies of the solicitation letters (preferably on letterhead of the bidding entity) used in the bidding process. You are not required to select the lowest bidder, but if you do not, you will have to provide a brief written justification for your selection. Note: there is NO threshold level under the RACP program regardless of the size or dollar amount associated with the work to be performed. You need to show that you solicited a minimum of three (3) bids for any contract to be eligible for RACP.

Bidding is acceptable at either the general contractor level (described in option a. below) or at the sub-contractor level (described in option b. below):

- **General Contractor (GC) Level** - If you chose to bid at the GC level, please note that the bid should encompass the entire RACP scope of work to be performed including all associated construction work. The dollar amount bid on the project must include 100% of the work to be performed by the GC and the sub-contractors. Bidding at the GC level will require submission of bidding and construction related documents at the GC level only (see Sub-Contractor level below for a distinction)
- **Sub-Contractor Level** - If you choose not to solicit three bids for a General Contractor, then you are required to solicit a minimum of three bids for EACH Sub-Contractor covering all trades involved in the project. Note that any self-performed work by a non-bid GC is NOT an eligible cost for reimbursement OR match purposes. Bidding at the Sub-Contractor level will require submission of bidding and construction related documents at the sub level…meaning proof of

bidding, construction contracts, payment and performance bonds, insurance etc. will need to be provided for every sub-contractor in the RACP scope.

Professional Services: Professional services associated with the project are not required to be bid as these associated costs are only eligible as match.

Change Orders: Grantees and/or Sub-Grantees are not required to competitively bid out change orders as long as the work was within the RACP scope of the original bid and is less than 20% of the total contract. If a change order is for work beyond the RACP scope of work originally bid, the Grantee will be required to competitively bid out the new scope of work in order to be considered RACP eligible.

PENNSYLVANIA STEEL PRODUCTS PROCUREMENT ACT

The Office of the Budget (OB) cannot grant waivers to the Pennsylvania Steel Products Procurement Act (SPPA) unless the terms of the law change. All RACP Grantees must comply with the SPPA. If a Grantee/RACP project fails to abide by the SPPA, it does so at its own risk.

A full explanation on the RACP steel requirements is available as a PDF download.

Up to 2011, OB only accepted the ST-4 Form (justification for the use of foreign steel) that the Department of General Services (DGS) had exclusively devised to address exceptions linked to the requirements of the SPPA, when it was necessary. Since 2011, OB has approved the acceptability of two more DGS ST Forms (ST-2, ST-3) with some caveats, providing that the forms are properly filled out. The ST-1 Form will not be accepted by OB. It is not necessary for the ST-2, ST-3, and ST-4 Forms to be notarized.

Effective January 1, 2013, OB began utilizing the DGS Exempt Machinery and Equipment Steel Products listings (2022, 2021, 2020) as part of our steel policy. DGS published a Statement of Policy- Steel products procurement in the Pennsylvania Bulletin Volume 43, Number 6 dated February 9, 2013 (See PA Bulletin #43, pages 85-86) that discussed the exemption of certain steel products, based on their analysis of ST-4 forms submitted that list products not produced domestically in sufficient quantity. DGS publishes an updated "Exemption List" annually.

Please be aware that ST forms are acceptable only in cases where nonstructural steel needs to be addressed. The DGS ST forms do not replace the steel certification forms associated with structural steel. OB will continue to require the submission of steel mill certifications to demonstrate compliance with the steel requirements for structural steel.

The PDF copies of the three acceptable ST Forms for RACP listed below can be obtained from the RACP website:

- ST-2 Steel Origin Certification: Non-Identifiable, Non-Structural Steel
- ST-3 75% U.S. Manufacture Certification
- ST-4 Not Domestically Manufactured: Prime Contractor (only to be used when requesting items to be exempted that are not found on the current year's List of Exempt Machinery and Equipment Steel Products)

It is suggested that the certifications be collected at the time any steel for the project is purchased and delivered to ease the collection process.

Be advised that OB DOES NOT need to approve the ST forms prior to the start of the construction period. The ST forms need to be submitted to demonstrate that compliance, when and where necessary, has been met.

We shall deem as ineligible all contracts that are unable to demonstrate compliance via the submission of steel certifications for Structural Steel and for Non-structural Steel the submission of steel certifications and/or ST forms and/or DGS Exempt Machinery and Equipment Steel Products List. Therefore, the value of construction contracts associated with non-compliant steel will be removed (both materials and labor costs) from the scope of the project, which may in turn affect the project's ability to leverage their full grant amount (project may not receive its full grant).

Recycled products, melted from previously used steel, are acceptable, providing that adequate documentation from the supplier has been furnished. The supplier shall certify that the recycled steel product was produced in the USA.

TRADE PRACTICES ACT

In accordance with the Trade Practices Act of July 23, 1968, P.L. 686 (71 P.S. § 773.101 et seq.), the Grantee cannot and shall not use or permit to be used in the work any aluminum or steel products made in a foreign country which is listed below as a foreign country which discriminates against aluminum or steel products manufactured in Pennsylvania. The countries of Argentina, Brazil, South Korea, and Spain have been found to discriminate against certain products manufactured in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted:

- **Argentina:** carbon steel wire rod and cold-rolled carbon steel sheet.
- **Brazil:** welded carbon steel pipes and tubes; carbon steel wire rod; tool steel; certain stainless steel products, including hot-rolled stainless steel bar; stainless steel wire rod and cold-formed stainless steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet; and cold-rolled carbon steel sheet.
- **South Korea:** welded carbon steel pipes and tubes; hot-rolled carbon steel plate; hot-rolled carbon steel sheet; and galvanized steel sheet.
- **Spain:** certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars; and cold-formed stainless steel bars; pre-stressed concrete steel wire strand; and certain steel products, including hot-rolled steel plate, cold-rolled carbon steel plate, carbon steel structural shapes; galvanized carbon steel sheet, hot-rolled carbon steel bars, and cold-formed carbon steel bars.

Penalties for violation of the above paragraphs may be found in the Trade Practices Act, which penalties include becoming ineligible for public works contracts for a period of three years.

This provision in no way relieves the Grantee of responsibility to comply with those provisions which prohibit the use of foreign-made steel and cast iron products.

PUBLIC WORKS CONTRACTORS' BOND LAW (PAYMENT & PERFORMANCE BONDS)

The requirement for 100% payment and performance (P&P) bonds is a state law; the Office of the Budget cannot waive this requirement.

A performance bond must be obtained at 100% of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications, and conditions of the contract. Such bond shall be solely for the protection of the contracting body which awarded said contract.

A payment bond must be obtained at 100% of the contract amount. Such bond shall be solely for the protection of claimants supplying labor or materials to the Grantee, its contractor or to any of its subcontractors, in the prosecution of the work provided for in such contract, and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the work. "Labor or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site.

PA PREVAILING WAGE ACT (PWA)

The Office of the Budget cannot grant waivers for the PA Prevailing Wage Act. All Grantees must comply with the act. Grantees that fail to abide by the Prevailing Wage Act do so at their own risk. Please do not assume that PA Prevailing Wage is always consistent with your local union wages.

All projects should apply for a wage determination letter prior to the start of construction by registering the project with the PA Department of Labor and Industry to obtain the prevailing wage rates relevant to your project. This determination sheet will provide the necessary trade classifications for the project, along with their corresponding hourly wage and hourly fringe rates that are required for the certified payrolls required as part of RACP. The wage determination should be obtained within 120 days of the award of construction contracts. If necessary, the Department of Labor and Industry can issue determinations letters after construction has begun.

The prevailing wage information and forms can be found on the PA Department of Labor & Industry website.

AMERICANS WITH DISABILITIES ACT (ADA)

Typically your architect should provide a letter stating the plans and specs are in compliance with ADA regulations. Additionally, the Grantee agrees to comply with the General Prohibitions Against Discrimination, 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans with Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the commonwealth through contracts.

FIDELITY BONDS

The Grantee shall procure and furnish evidence to OB of fidelity bonds with coverage to be maintained under the administrative title of the position in amounts and for such positions as are reasonably

determined by OB. Fidelity Bonding is also commonly known as "Employee Dishonesty Insurance." The minimum level of coverage should equal the average monthly RACP reimbursement amount based on the total grant amount.

INSURANCE REQUIREMENTS

- Worker's Compensation Insurance - The Grantee shall provide Worker's Compensation Insurance where required, and shall accept full responsibility for the payment of premiums for Worker's Compensation Insurance and Social Security, as well as income tax withholding and any other taxes or payroll deductions required by law for its employees who are performing services related to the project.

- General Liability & Property Damage Insurance - The Grantee will provide and maintain comprehensive general liability and property damage insurance in the minimum amount of $250,000.00 per person for injury and death in a single occurrence; $1,000,000.00 per occurrence for injury or death of more than one (1) person in a single occurrence; and $500,000.00 for a single occurrence of property damage, and which shall be endorsed to protect the commonwealth.

- Flood Insurance – If the project is wholly or partially within a floodplain, proof of sufficient flood insurance coverage must be provided. In any case, a project is required to provide a copy of a floodplain map of the project area, with the project site being delineated thereon.

Identify Commonwealth as Additional Insured: The commonwealth shall be listed on the above insurance policies as an additional insured. Upon request, the Grantee shall furnish proof of insurance as required by this section to OB.

RESTRICTIONS ON GOVERNMENTAL ENTITIES SELLING RACP PROJECTS

Article 8 of the RACP Grant Agreement spells out sale price restrictions for a governmental entity that sells property that was acquired and/or improved with RACP funds. The restrictions are required to insure that the Grantees CANNOT sell the property for a net gain or even recoup the value of the grant in the sale price. A PDF download is available that contains more information on Article 8.

LOCAL SHARE ACCOUNT PROJECT DOCUMENTS CHECKLIST

FOR CONSTRUCTION PROJECTS:

- ❑ **Bid advertisement – A copy of the ad from the newspaper or Proof of Publication provided by the newspaper**
- ❑ **Bid Specifications including the PA Prevailing Wage Determination (for projects over $25,000)**
- ❑ **Bid Tabulation – A list of all bidders, their bid amount and why the winning bidder was selected (can be awarded to the lowest responsible bidder)**
- ❑ **Signed contract with the winning bidder that includes the Non-Discrimination/Sexual Harassment Clause. See attached.**
- ❑ **A copy of the Performance and Payment Bonds from the contractor**
- ❑ **A Certificate of Liability Insurance that names the Commonwealth Financing Authority and Monroe County Industrial Development Authority as an additional insureds**

FOR CONSTRUCTION PAYMENT REQUESTS:

- ❑ **A copy of the executed AIA Payment Application or a signed invoice with the amount and date submitted by the contractor**
- ❑ **Certified Payrolls to support the Payment Application**

FOR ENGINEERING/PROFESSIONAL SERVICES PROJECTS

- ❑ **Bidding of these services is not required, but we must have an explanation as to why the provider was selected.**
- ❑ **Signed Professional Services Agreement that includes the Non-Discrimination/Sexual Harassment Clause.**
- ❑ **A copy of an invoice for the services provided. Must be dated after the date of LSA grant approval.**

FOR MACHINERY & EQUIPMENT PURCHASE PROJECTS:

- ❑ **For purchases through COSTARS or from a sole-source vendor, a copy of the Invoice for the order.**
- ❑ **For other purchases between $11,800 and $21,900, three written or telephonic quotes must be solicited.**
- ❑ **For projects over $21,900, formal bidding must be followed. A copy of the Proof of Publication and all responses must be provided.**
- ❑ **For projects over $25,000 that include labor costs for the installation of machinery and/or equipment, a PA Prevailing Wage Determination will be required, along with Certified Payroll Reports.**
- ❑ **For purchases not through COSTARS but less than $11,800, a copy of an invoice for the purchase dated after the date of the LSA grant approval.**

EXHIBIT A:

NONDISCRIMINATION/SEXUAL HARASSMENT CLAUSE

During the term of the Contract, the Applicant (known herein as "Grantee") agrees as follows:

1. In the hiring of any employee(s) for the manufacture of supplies, performance of work, or any other activity required under the grant agreement or any subgrant agreement, contract, or subcontract, the Grantee, a subgrantee, a contractor, a subcontractor, or any person acting on behalf of the Grantee shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the *Pennsylvania Human Relations Act* (PHRA) and applicable federal laws, against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

2. The Grantee, any subgrantee, contractor or any subcontractor or any person on their behalf shall not in any manner discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against or intimidate any of its employees.

3. Neither the Grantee nor any subgrantee nor any contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, in the provision of services under the grant agreement, subgrant agreement, contract or subcontract.

4. Neither the Grantee nor any subgrantee nor any contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against employees by reason of participation in or decision to refrain from participating in labor activities protected under the *Public Employee Relations Act*, *Pennsylvania Labor Relations Act* or *National Labor Relations Act*, as applicable and to the extent determined by entities charged with such Acts' enforcement, and shall comply with any provision of law establishing organizations as employees' exclusive representatives.

5. The Grantee, any subgrantee, contractor or any subcontractor shall establish and maintain a written nondiscrimination and sexual harassment policy and shall inform their employees in writing of the policy. The policy must contain a provision that sexual harassment will not be tolerated and employees who practice it will be disciplined. Posting this Nondiscrimination/Sexual Harassment Clause conspicuously in easily-accessible and well-lighted places customarily frequented by employees and at or near where the grant services are performed shall satisfy this requirement for employees with an established work site.

6. The Grantee, any subgrantee, contractor or any subcontractor shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against any subgrantee, contractor, subcontractor or supplier who is qualified to perform the work to which the grant relates.

7. The Grantee and each subgrantee, contractor and subcontractor represents that it is presently in compliance with and will maintain compliance with all applicable federal, state, and local laws and regulations relating to nondiscrimination and sexual harassment. The Grantee and each subgrantee, contractor and subcontractor further represents that it has filed a Standard Form 100 Employer Information Report ("EEO-1") with the U.S. Equal Employment Opportunity Commission ("EEOC") and shall file an annual EEO-1 report with the EEOC as required for employers' subject to *Title VII* of the *Civil Rights Act of 1964*, as amended, that have 100 or more employees and employers that have federal government contracts or first-tier subcontracts and have 50 or more employees. The Grantee, any subgrantee, any contractor or any subcontractor shall, upon request and within the time periods requested by the Commonwealth, furnish all necessary employment documents and records, including EEO-1 reports, and

permit access to their books, records, and accounts by the granting agency and the Bureau of Diversity, Inclusion and Small Business Opportunities for the purpose of ascertaining compliance with the provisions of this Nondiscrimination/Sexual Harassment Clause.

8. The Grantee, any subgrantee, contractor or any subcontractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subgrant agreement, contract or subcontract so that those provisions applicable to subgrantees, contractors or subcontractors will be binding upon each subgrantee, contractor or subcontractor.

9. The Grantee's and each subgrantee's, contractor's and subcontractor's obligations pursuant to these provisions are ongoing from and after the effective date of the grant agreement through the termination date thereof. Accordingly, the Grantee and each subgrantee, contractor and subcontractor shall have an obligation to inform the Commonwealth if, at any time during the term of the grant agreement, it becomes aware of any actions or occurrences that would result in violation of these provisions.

10. The Commonwealth may cancel or terminate the grant agreement and all money due or to become due under the grant agreement may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the granting agency may proceed with debarment or suspension and may place the Grantee, subgrantee, contractor, or subcontractor in the Contractor Responsibility File.

_____ _____

Signature Date

_____ _____

Printed Name Title

_____

Company

SECTION 01 1000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.

B. Related Section:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Alterations & Heritage Center Addition.
1. Project Location: 900 Main Street, Stroudsburg, PA 18360.

B. Owner: Monroe County Historical Association, 900 Main Street, Stroudsburg, PA 18360.

C. Construction Manager: David Policelli, 2155 Whitehead Road, Nazareth, PA 18064. 610-392-8772 david.policelli@gmail.com

D. Architect: MKSD, LLC; 1209 Hausman Road, Suite A, Allentown, PA 18104. 610-366-2081 Scott Focht sdf@mksdarchitects.com

E. The General Contractor shall be responsible for the coordination between all subcontractors.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Project consists of Alterations & Heritage Center Addition.

2. Contract Documents, dated 01.26.23 were prepared for the Project by MKSD, LLC., 1209 Hausman Road, Suite A, Allentown, PA 18104.

B. Type of Contract.
1. Project will be constructed under a single contract.
2. The Owner reserves the right to award additional prime contracts or to perform construction operations with its own forces on portions of the project.

1.5 ACCESS TO SITE

A. Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to as required to allow Owner to continue operations throughout the construction period.
2. Owner Occupancy: Owner will partially occupy the site and buildings. Refer to the Documents and the details outlined in this section and elsewhere in the Contract Documents which outline the general sequence of construction as it relates to the Work being conducted on operating building property.
   a. All work must be completed in a sequence approved by the Architect and Owner in compliance with the project phasing requirements.
3. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
4. The site contains Electric and Gas utility easements. Comply with all applicable utility company requirements.
5. Comply with all local municipalities' requirements with respect to the installation of renovations, new work, site work and connections to any utilities.

1.6 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will partially occupy site and existing building during the completion of the construction period. Contractor shall cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Contractor shall perform the Work so as not to interfere with Owner's day-to-day operations. In the event that short- or long-term interruption of any service is required, it shall be scheduled during times when convenient to the Owner.
1. Maintain existing exits unless otherwise indicated.

2. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or

used facilities without written permission from the Owner and approval of Authorities Having Jurisdiction.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from Authorities Having Jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 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 the Drawings are described in detail in the Specifications. One or more of the following are used on the 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. General Construction Contract (GC)
   1. Refer to Bid Form for Alternates.

END OF SECTION 01 2300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within [**15**] days of receipt of request, or [**seven**] days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that specified product provided.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

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SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1. Multiple Prime Contracts

B. Related Sections: The following Sections contain requirements that relate to this Section.
1. Division 01 Section "Submittals" for requirements for the Prime Contractors.
2. Division 00 Section " Procurement Substitution " for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within **seven (7)** days, when not otherwise specified after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change to the Architect for the Owner’s review.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Prime Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Prime Contractor may initiate a claim by submitting a request for a change to Construction Manager/Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 00 "Procurement Substitution" if the proposed change requires substitution of one product or system for product or system specified.
5. Proposal Request Form: Use AIA Document G701 1992 for Change Order Proposal Requests.

1.5 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in the purchase amount only where indicated as part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
5. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Prime Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or

Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.

a. Do not include the Prime Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
b. No change to the Prime Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

B. Unit Price Adjustment: Refer to Division 01 Section “Unit Prices” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager/Architect will issue a Change Order for signatures of Owner and Prime Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Prime Contractor disagree on terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Prime Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

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SECTION 01 2900 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Prime Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Prime Contractor's Construction Schedule and Submittal Schedule are specified in Division 01 Section "Submittals."

1.3 SCHEDULE OF VALUES

A. Coordination: Each Prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Prime Contractors' Construction Schedule.

1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Prime Contractor’s Construction Schedule.
b. Application for Payment forms, including Continuation Sheets.
c. List of subcontractors.
d. Schedule of allowances.
e. Schedule of alternates.
f. List of products.
g. List of principal suppliers and fabricators.
h. Schedule of submittals.

2. Submit the schedule of values to Construction Manager/Architect upon request of Construction Manage/Architect but as early as 48 hours after the bid is

submitted, but no later than (fourteen) 14 days before the date scheduled for submittal of initial Applications for Payment.

3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments; provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's phone number.
    d. Prime Contractor's name and address.
    e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value.

        1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Unit-Cost Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Estimate quantities from the best indication in the Contract Documents.

8. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Prime Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: See AIA Document A132-2009 Article 5.1.3 for Application for Payment submittal schedule.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Prime Contractor. Incomplete applications without action.

    1. Entries shall match data on the schedule of values and Prime Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Construction Manager/Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments when required.

    1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application, in a manner acceptable to the Architect.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Approved Prime Contractor's Construction Schedule.
5. Schedule of principal products.
6. Schedule of unit prices.
7. Submittal Schedule (preliminary if not final).
8. List of Prime Contractor's staff assignments.
9. List of Prime Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from governing authorities for performance of the Work.
12. Initial progress report.
13. Report of preconstruction meeting.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire the Owner's insurance.
17. Initial settlement survey and damage report, if required.
18. Weekly Payroll Certificates for Public Works Projects, 1st submittal to be notarized.

H. Application for Payment at Substantial Completion: Following Issuance of the Certificate of Substantial Completion, Submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include: Occupancy permits and similar approvals.
    a. Warranties (guarantees) and maintenance agreements.
    b. Test/adjust/balance records.
    c. Maintenance instructions.
    d. Meter readings.
    e. Startup performance reports.
    f. Changeover information related to Owner's occupancy, use, operation, and maintenance.
    g. Final cleaning.
    h. Application for reduction of retainage and consent of surety.
    i. Advice on shifting insurance coverages.
    j. Final progress photographs.
    k. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

I. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following: Completion of Project closeout requirements.
   1. Completion of items specified for completion after Substantial Completion.
   2. Ensure that unsettled claims will be settled.
   3. Ensure that incomplete Work is not accepted and will be completed without undue delay.
   4. Transmittal of required Project construction records to the Architect and Owner.
   5. Certified property survey.
   6. Proof that taxes, fees, and similar obligations were paid.
   7. Removal of temporary facilities and services.
   8. Removal of surplus materials, rubbish, and similar elements.
   9. Change of door locks to Owner's access.
   10. Weekly payroll certificates for public works projects, final payment to be notarized.
   11. Any other itinerary established by the Architect and/or Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

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SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. 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. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling[, raised access floor,] and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:

    a. Same digital data software program, version, and operating system as original Drawings.
    b. DWG, operating in Microsoft Windows operating system.

2. File Submittal Format: Submit or post coordination drawing files using PDF format.
3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Owner name.
2. Owner's Project number.
3. Name of Architect and Construction Manager.

4. Architect's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or Construction Manager of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within five days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect and Construction Manager.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.

6. Date the RFI was submitted.
7. Date Architect's and Construction Manager's response was received.

E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. The following digital data files will be furnished for each appropriate discipline:

a. Floor plans.
b. Reflected ceiling plans.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Preparation of Record Documents.
    o. Use of the premises and existing building.
    p. Work restrictions.
    q. Working hours.
    r. Owner's occupancy requirements.
    s. Responsibility for temporary facilities and controls.
    t. Procedures for moisture and mold control.
    u. Procedures for disruptions and shutdowns.
    v. Construction waste management and recycling.
    w. Parking availability.
    x. Office, work, and storage areas.
    y. Equipment deliveries and priorities.
    z. First aid.
    aa. Security.
    bb. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.

d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule

revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site use.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of Proposal Requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Submittals Schedule.
5. Daily construction reports.
6. Site condition reports.

B. Related Section:
1. Division 01 Section "Multiple Contract Summary" for preparing a combined Prime Contractor's Construction Schedule.
2. Division 01 Section "Application for Payment" for submitting the Schedule of Values.
3. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
4. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
5. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.
6. Division 01 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time belongs to Owner and shall only be assigned with Architect's approval.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

H. Resource Name: The name of the Contractor supplying manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Construction Manager, Architects and Owners, and other information specified.

B. Submittals Schedule: Submit seven copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's and all consultants and agencies final release or approval.

C. Preliminary Construction Schedule: Submit seven (7) opaque copies and one (1) electronic copy.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

D. Preliminary Construction Schedule Network Diagram: Submit seven (7) opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Final Construction Schedule: Submit seven (7) printed copies of the initial schedule large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label. The electronic copy is to be provided with no restrictions for viewing and analyzing using the same software with which the schedule was created.

F. Final Construction Schedule Reports: Submit three (3) copies of each of the following computer-generated reports with the Final Construction Schedule. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start dated, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by Project Phase, Project Area, Prime Contractor and then early start date. Provide a duration, cost and total float value for each activity.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

G. Daily Construction Reports: Submit two copies at weekly intervals.

H. Material Location Reports: Submit two copies at weekly intervals.

I. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

J. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Management and Coordination.” Review methods and procedures related to the Preliminary Construction Schedule and Prime Contractor’s Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.

4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner’s separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Prime Contractors.

B. Coordinate Prime Contractor's construction schedule with the schedule of values, subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Prime Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary schedule. Include submittals required during the first 90 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   a. Show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Prime Contractor's Construction Schedule.

2.2 PRIME CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Each activity on the network shall have indicated for it the following:
   1. A single duration, no longer than 20 days (i.e., the single best estimate of the expected elapsed time considering the scope of work involved in the activity) expressed in working days. Normal holidays and weather delays shall be included. One critical path shall be shown for the schedule.
   2. An activity identification number will be assigned to each activity. The identification number will be in a format acceptable to Architect.
   3. A brief description of the activity will be included. If this description is not definitive, a separate listing of each activity and a descriptive narrative may be required.
   4. Each activity shall be cost loaded to indicate the total estimated budget of the activity. No activity budget shall exceed $150,000 except for F&D activities. Material and/or equipment costs to be paid as stored material shall be assigned to F&D activities. In addition, activities shall be cost-loaded for use in generating monthly progress payments.
   5. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 40 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   6. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Prime Contractor's Construction Schedule with Submittals Schedule.
   7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Owner’s administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include separate activities for each contract.
   3. Work by Owner: Include separate activities for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section “Summary”. Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
7. Work Stages: For each Phase of the Work as described on the drawings, indicate stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards
    b. Submittals
    c. Purchases
    d. Mockups
    e. Fabrication
    f. Sample testing
    g. Deliveries
    h. Demolition
    i. Installation
    j. Shop and Field Tests and inspections
    k. Changes in traffic patterns
    l. Moving and occupancy timeframes
    m. Adjusting
    n. Curing
    o. Startup and placement into final use and operation
    p. Punchlist

8. Area Separations: Identify each major area of construction for each Phase of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Structural completion.
    b. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

E. Milestones and Phases: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Individual Phase Completion(s), Substantial Completion, Final Completion and the following interim milestones:
    1. All project milestones and phases listed in the Contract Documents.

F. Cost Correlations for Progress Payments: Provide cost loading of the Preliminary and Final schedule as follows:

1. Each activity on the construction schedule shall be allocated a dollar value in accordance with above. Each activity's assigned cost shall consist of labor, equipment, and materials costs, and a pro-rata contribution of overhead and profit. The sum of activities costs shall be equal to the total Contract Price. In submitting cost data Prime Contractor certifies that the costs are not unbalanced and that the value assigned to each activity represents Prime Contractor's estimate of the actual costs of performing that activity.

2. The accepted schedule of values shall represent a fair, reasonable and equitable dollar cost allocation for each activity on Prime Contractor's construction schedule.

3. If it is determined that the cost data does not meet the requirements for a balanced bid breakdown in the opinion of Architect, Prime Contractor will present documentation substantiating the cost allocation. Cost allocations shall be considered unbalanced if an activity on the construction schedule has been assigned a disproportionate allocation of direct costs, overhead and profit.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using Microsoft Project, Gantt Chart View.

2.3 PRELIMINARY CPM CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Each Prime Contractor and trade Sub-Contractors shall submit preliminary horizontal bar-chart-type construction schedule within fourteen (14) days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Provide construction activities for first 90 days of construction. Include costs for each activity.

2.4 FINAL CONSTRUCTION SCHEDULE

A. Bar Chart Schedule: Prepare Prime Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled Bar Chart (Microsoft Projects – Gantt Chart)

1. Develop schedule in sufficient time to submit schedule so it can be accepted for use no later than 30 calendar days after date established for the Notice to Proceed for Construction.

    a. Failure to include any work item required for performance of this Contract shall not excuse Prime Contractor from completing all work within applicable completion dates, regardless of Architect’s approval of the schedule.

2. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

B. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports and electronic copies on a monthly basis showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.5 FIELD REPORTS

A. Daily Construction Reports: Each Prime Contractor and Trade Co-Contractor shall prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented. Construction or Work Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the

differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner and Architect within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Prime Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner and Architect in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 FIELD REPORTS

A. Contractor is to submit Daily Construction Reports on a daily basis to the Owner's Representative. Failures to maintain timely or complete reports may result in partial withholding of monthly payment applications.

3.2 PRIME CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Requirements for the General Contractor as the Project Coordinator. As Project Coordinator, the Contractor for General Construction shall:

1. Engage a scheduling consultant to perform, for and on behalf of the Contractor, the Contractor's duties and responsibilities as Project Coordinator, including those specifically set forth below. The scheduling consultant shall have a minimum of five (5) years prior experience in the design, preparation, publication and revision of PCM network schedules, including scheduling experience on multiple prime contractor, multiple phase construction projects. The Contractor shall submit the name, credentials and experience of its proposed scheduling consultant to the Owner, Architect and Construction Manager for approval within five (5) days of being awarded the Contract. The Contractor; (a) shall not terminate the engagement of any approved scheduling consultant without at least thirty (30)days prior written notice to the Owner , Architect and Construction Manager, and then only after submission and approval of a replacement scheduling consultant in accordance with the provisions of this paragraph; and (b) shall not engage any scheduling consultant as to whom the Owner, Architect and Construction Manager, at any time, make reasonable objection and shall promptly replace such scheduling consultant with another approved in accordance with the provisions of this paragraph.

A. Prime Contractor's Construction Schedule Updating: At monthly intervals or as requested by Architect, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting. Provide an electronic copy of each monthly schedule update. Provide an indication of the total project float in the schedule on a monthly basis.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

B. Distribution: Distribute copies of approved schedule to Architect, separate Contractors, testing and inspecting agencies, and other parties identified by Architect with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

C. The Bar Chart type construction schedule will be used to monitor job progress and as a means to make monthly payments to Prime Contractor. Prime Contractor will be responsible for providing all information concerning the sequencing, logic and durations of all activities. Once the schedule is accepted, Each Prime Contractor will be responsible for providing monthly update information on logic, percent complete, actual start and finish dates and duration changes. Prime Contractors will be required to produce the computerized printout of the schedule updates.

E. From Prime Contractor's initial schedule submittal and from information received at the monthly schedule update meetings, computerized and dated tabular schedule reports, or updated network diagrams, or bar charts which will be reviewed by Each Prime and Trade Contractor for accuracy and integrity. It shall at all times remain Prime Contractor's responsibility to schedule and direct his forces in a manner that will allow for the completion of the work within the contractual period.

F. It should be clearly understood that the initial schedule and all update information must be provided by Prime Contractor and that this information is a representation of the best efforts of Prime Contractor and his subcontractors as to how they envision the work to be accomplished. Similarly, all progress information to be provided by and through Prime Contractor must be an accurate representation of his or his subcontractor’s or supplier's actual performance. The schedule shall at all times remain an accurate reflection of Prime Contractor's actual or projected sequencing of work. Once accepted, adherence to the established schedule shall be obligatory upon Prime Contractor and his subcontractors for the work under this Contract. Architect or Owner may require Prime Contractor to revise the schedule if, in his judgment, the schedule does not accurately reflect the actual execution of the work, or is in violation of any provision of this scheduling specification, and Prime Contractor shall revise the schedule as often as is necessary during the course of performance of the work without additional cost to Owner.

G. The work shall be started on the date indicated in the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other Prime Contractors or to the general completion of the project. The work shall be executed at

such times and in or on such parts of the project, and with such forces, material and equipment, as to assure completion of the work in the time established by the Contract. Additionally, Prime Contractor shall, at all times, schedule and direct his work so that it provides an orderly progression of the work to completion within the specified Contract Time.

H. Prime Contractor agrees that whenever it becomes apparent from the current monthly Schedule update that delays to the critical path have resulted and these delays are through no fault of Owner or Architect or Construction Manager, and hence, that the Contract completion date will not be met, or when so directed by Construction Manager/Architect will take some or all of the following actions at no additional cost to Owner.

1. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.

2. Increase the number of working hours per shift; shifts per working day, or days per week; the amount of construction equipment; etc., or any combination of the foregoing to substantially eliminate the backlog of work.

3. Schedule activities to achieve maximum practical concurrence of accomplishment of activities, and comply with the revised schedule.

4. Prime Contractor shall submit for reviewing a written statement of the steps he intends to take, to remove or arrest the delay to the schedule. If Prime Contractor fails to submit a written statement of the steps he intends to take or fails to take such steps as required by the Contract, Architect/Construction Manager or Owner may direct the level of effort in manpower (trades), equipment, and work schedule (overtime) to remove or arrest the delay to the critical path in the accepted schedule, and Prime Contractor shall promptly provide such level of effort at no additional cost to Owner. In addition, should schedule delays persist, Prime Contractor's surety will be asked to attend meetings to update the schedule.

I. Failure of Prime Contractor to comply with the requirements of this provision shall subject him to, at Owner's sole discretion, withholding, in partial or in total, payments otherwise due Prime Contractor for work performed under this Contract. Prime Contractor agrees that any withholding of moneys is not a penalty for noncompliance, but is an assurance for Owner that funds will be available to implement these requirements should Prime Contractor fail to do so, since failure of Prime Contractor to comply with these requirements shall mean that Prime Contractor failed to execute the work with such diligence as to ensure its completion within the time for completion.

3.2 NETWORK REQUIREMENTS

A. The Schedule shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by Prime Contractor. The basic concept of the network analysis diagram is to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of succeeding activities. A time scaled precedence format will be followed. The detailed network diagram will be time scaled showing a continuous flow from left to right.

B. The schedule shall include a weather calendar that contains non-working days in addition to weekend and holidays to account for anticipated inclement weather days. The number of anticipated inclement weather days per month shall be equal to those specified in Figure 2 of this Specification Section. The weather calendar shall be applied to all activities, which may be affected by inclement weather.

C. Failure to include in the schedule any element of Work required under the performance of this Contract shall not excuse Prime Contractor from completing all Work required within the applicable completion time, notwithstanding Owner's network review.

D. A schedule which shows a completion of any portion of the Work prior to the contractual completion date may be accepted but in no event shall be acceptable as a basis for a claim for delay against Owner or its representatives by Prime Contractor. The period of time between the Prime Contractor's baseline accepted schedule's projected completion dates and the contractual stipulated completion dates, if any, will be treated as Project Float. The Owner's right to utilize Project Float is as provided in 01 3200.

E. If a review of the submitted Schedule indicates a work plan which will not complete the work within the time requirements stated in the Contract, it shall be the responsibility of Prime Contractor to revise the Schedule as required and resubmit it until it is acceptable. Failure by Prime Contractor to submit an acceptable schedule may, at Owner's sole discretion, justify the withholding of any partial payment(s) otherwise due under the Contract.

F. Acceptance of the schedule shall not constitute a representation by Architect or Owner that the work can be completed as shown on the schedule.

3.3 SCHEDULE UPDATES

A. A monthly Schedule Update Meeting will be held one (1) week prior to the progress meeting at the construction site to review and update the Schedule. The Schedule Update Meeting will be attended by Construction Manager/Architect and Prime Contractor. Actual progress of the previous month will be recorded and scheduling of future work activities will be reviewed. The duration of activities and their logical connections may be revised as needed. Decisions made at these meetings and agreed to by all parties are binding with the exception that no contractual completion dates will be modified without formal written requests and acceptance as specified herein. Each Prime Contractor must provide the following information for each update at a minimum:

1. Actual start and finish dates for all completed activities.
2. Actual start dates for all started but incomplete activities and estimated remaining durations.

B. Provide a Monthly Progress Status Report, which provides a narrative explanation of progress identified in the revised construction schedule. The report shall indicate the following items:

1. Summarize revisions made to the Construction Schedule since the previous submittal.
2. Work completed during the reporting period.

3. A printed copy of the entire project schedule including the updated early and late dates, activity durations, predecessors and successors and a list of any logic and duration changes executed during the update period.
4. Work anticipated to be started during the next period, including those activities already in progress.
5. Problem areas, anticipated delays, and their impact on the schedule.
6. Corrective action recommended, and its effect.
7. The effect of changes on schedules of other Prime Contractors.
8. Updated Tabulation of Contract Time.
9. An evaluation of the overall status of the schedule for the job.

C. Failure to provide update information listed in 3.3.A and B above, or failure to attend the Monthly Progress Meeting may result in Prime Contractor not receiving progress payments.

3.4 CAUSES FOR EXTENSIONS OF TIME

A. The Contract Times will be adjusted only for causes specified in this Contract. In the event Prime Contractor requests an extension of Contract Time, he shall furnish justification and supporting evidence per requests specified elsewhere in these Contract Documents. Prime Contractor acknowledges and agrees that actual delays in activities, which, according to the schedule, do not affect any contract completion date shown by the critical path in the network, do not have any effect on the Contract Time, and therefore will not be the basis for a change in Contract Time.

B. Contract Time extensions for weather delays will be based only on the following criteria.

1. General Requirements: Even though a cause of delay meets any, or all, of the conditions stated herein, it shall in all cases be presumed that no extension, or further extension, of time is due unless Prime Contractor shall demonstrate that the delay is justified and had an impact to the critical path of the updated schedule for the delay period. To this end, Prime Contractor shall maintain adequate records supporting any claim for an extension of time and shall submit such records, including a revised schedule showing the impact of the delay, with the claim. Claims due to weather shall be submitted on a monthly basis and within five days after the end of the previous month of such delay.

2. The Construction Manager/Architect and Owner will determine Prime Contractor's entitlement to an extension of the Contract Time, but in no event shall an extension be granted for days outside the contract period. Daily records, maintained by the Lehigh Valley International Airport, shall be the official source for weather data related to precipitation and temperature. A time extension of no more than one day will be granted for one day of lost work, regardless of the number of allowable reasons for lost time. The period of any extension of time shall be only for the portion of the contract actually delayed due to the abnormal weather conditions. Any extension of Contract Time allowed under any of the following conditions shall be considered non-compensable and have no impact on Contract Price.

(a) If the total inches precipitation in a given month is less than the average stated below in Figure 1, no time extension due to precipitation will be allowed. If the average inches of precipitation for the month is exceeded, the following formula will be used to calculate the number of days allowed as a time extension due to precipitation during the month in question:

Total actual days of precipitation greater than one-tenth (0.10") inch
Less expected precipitation days from Figure 2
Equals days allowable due to precipitation

(b) Time extension of snow shall be based on above normal snow for the project area and only based on direct impact to the schedule. Three inches (3") or more of snow cover is considered to be justification for a one-day time extension for each day of 3" or more of snow coverage.

(c) Temperatures above or below the statistical mean are not considered to be justification for an extension of Contract Time.

Figure 1
Normal Precipitation (All Measurements are in Inches)

JAN	FEB	MA	APR	MA	JUN	JUL	AU	SEP	OC	NO	DE
3.5	3.0	4.2	3.3	4.5	3.6	4.0	4.0	4.25	3.6	3.3	3.7

Figure 2
Average Number of Calendar Days with Precipitation of 0.10 Inch or More

JAN	FEB	MA	APR	MA	JUN	JUL	AU	SEP	OC	NO	DE
9	8	9	9	10	8	9	8	7	7	8	8

3.5 ADJUSTMENT BY OWNER

A. From time to time it may be necessary for the Contract schedule and/or Contract Times to be adjusted by Construction Manager/Architect and Owner due to the effects of job conditions, acts or omissions of other Prime Contractors not directly associated with this contract, act of God, technical difficulties, unavoidable delays on the part of Construction Manager/Architect and Owner or his representatives, and other unforeseeable conditions which may indicate schedule adjustments and/or an extension of the Contract Time. Under such conditions, Owner shall direct Prime Contractor to reschedule the work to reflect the changed conditions, and Prime Contractor shall revise his schedule accordingly. Schedule extensions affecting the Contract Time shall be granted only by the Owner in writing. No additional compensation shall be made to Prime Contractor for such schedule changes except for unavoidable overall Contract delays, in which case Prime Contractor shall take all possible action to minimize any time extension. It is specifically noted that available Project Total or Free Float in the CPM schedule may be used by the

Owner and his representative to accommodate any adjustments in time, therefore eliminating the need for a time extension.

3.6 FLOAT TIME

A. Without obligation to extend the overall completion date or any intermediate completion dates set out in the Schedule, Architect and Owner may initiate changes to the Contract work that absorb float time. Owner-initiated changes that affect the critical path on the Schedule shall be the sole grounds for extending (or shortening) said completion dates. Prime Contractor-initiated changes that encroach on the float time identified in the Schedule may be accomplished with Owner's concurrence. Such changes, however, shall give way to Owner-initiated changes competing for the same float time.

END OF SECTION 01 3200

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SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for the submittal by each Prime Contractors schedule and administrative and procedural requirements for performance of the work, including the following:

1. Prime Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Quality assurance submittals.

B. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of subcontractors.

C. Related Sections:

1. Division 00 Section "Supplementary General Conditions" for electronic file order form" for architectural drawings.
2. Division 01 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Prime Contractor's construction schedule.
3. Division 01 Section "Project Management and Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
4. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

5. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1. Preparation of Coordination Drawings is specified in Division 01 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

D. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

E. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Construction Manager/ Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

    a. Allow 10 business days for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow 5 business days for reprocessing each submittal.
    d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

4. HVAC Contractor shall provide ductwork layout drawings to all trades for co-ordination and approval prior to proceeding with final submission and installation.

5. All Prime Contractors shall furnish a list of “long lead” items to the Architect within ten (10) days of signed agreement. Shop drawings for said items shall follow within thirty (30) days of signed agreement.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect if requested for Prime Contractor's use in preparing submittals.

1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
2. Prime Contractor shall execute a data licensing agreement in the form.
3. Processing costs may apply.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
    1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Prime Contractor's review and approval markings and the action taken.

    2. Include the following information on the label for processing and recording action taken:

        a. Project name.
        b. Date.
        c. Name and address of the Architect.
        d. Name and address of the Prime Contractor.
        e. Name and address of the subcontractor.
        f. Name and address of the supplier.
        g. Name of the manufacturer.

h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Prime Contractor to the Construction Manager using a transmittal form and submitting through the Construction Manager's project management software Procore. The Construction Manager will not accept submittals received from sources other than the Prime Contractor.
1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Prime Contractor's certification that information complies with Contract Document requirements

2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

1.6 PRIME CONTRACTORS CONSTRUCTION SCHEDULE

A. Refer to Section 01 3200 "Construction Progress Documentation" for specific scheduling requirements.

1.7 SUBMITTAL SCHEDULE

A. After development and acceptance of the Prime Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 5 days of the date required for submittal of the Prime Contractor's Construction Schedule.
1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Prime Contractor's Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:

a. Scheduled date for the first submittal.
b. Related Section number.
c. Submittal category (Shop Drawings, Product Data, or Samples).
d. Name of the subcontractor.
e. Description of the part of the Work covered.
f. Scheduled date for resubmittal.
g. Scheduled date for the Architect's final release or approval.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner's representative, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.8 DAILY CONSTRUCTION REPORTS

A. Each Prime Contractor shall prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Architect at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Emergency procedures.
9. Orders and requests of governing authorities.
10. Change Orders received, implemented.
11. Services connected, disconnected.
12. Equipment or system tests and startups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized

1.9 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on “PDF” sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 36 by 48 inches (890 by 1220 mm).
7. Initial Submittal: Submit one correctable, PDF (or other approved digital format) file for the Architect's review. The Architect will return the one (1) file.
8. Initial Submittal: Submit one (1) file for Architect's review. The Architect will return one(1) file.
9. Final Submittal: Submit one (1) PDF (or other approved digital format) file; submit 5 prints where specifically required for maintenance manuals. The Architect will retain 2 prints and return the remainder.
10. Final Submittal: Submit 3 blue- or black-line prints and 2 additional prints where specifically required for maintenance manuals, plus the number of prints needed by the Architect for distribution. The Architect will retain 2 prints and return the remainder.
    a. One of the prints returned shall be marked up and maintained as a "Record Document."
11. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.10 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
   1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
      a. Manufacturer's printed recommendations.
      b. Compliance with trade association standards.
      c. Compliance with recognized testing agency standards.
      d. Application of testing agency labels and seals.
      e. Notation of dimensions verified by field measurement.
      f. Notation of coordination requirements.
   2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
   3. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
   4. Submittals: Submit one (1) PDF (or other approved digital format) file of each required submittal; submit 6 copies where specifically required for maintenance manuals. The Owner and Architect will retain three and will return the other marked with action taken and corrections or modifications required.
      a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
   5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
      a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

b. Do not permit use of unmarked copies of Product Data in connection with construction.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.11 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.12 ARCHITECT'S ACTION

A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
1. Compliance with specified characteristics is the Prime Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When the Architect marks a submittal "No Exception Taken," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. Final-But-Restricted Release: When the Architect marks a submittal "Make Corrections Noted" – "Do Not Re-Submit", the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. Returned for Resubmittal: When the Architect marks a submittal "Rejected" – "Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

   a. Do not use, or allow others to use, submittals marked "Rejected", Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

C. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 3300

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Prime Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Architect.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Prime Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Prime Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Prime Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Prime Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Prime Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections:
1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

2. Division 1 Section "Submittals" specifies requirements for development of a schedule of required tests and inspections.

3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Prime Contractor or another entity engaged by Prime Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect 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 Architect for a decision before proceeding.

1.5 RESPONSIBILITIES

A. Prime Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, each Prime Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum.
   1. Unless specifically noted the individual Sections, all inspections, tests, and other quality-control services are the Prime Contractor's responsibility, the Prime Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services shall be included in the Contract Sum.
   2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

B. Retesting: The Prime Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Prime Contractor's responsibility.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify

the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the work
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Provide security and protection of samples and test equipment at the Project Site.

D. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1.6 INFORMATIONAL SUBMITTALS

A. Prime Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

B. Testing Agency Qualifications: Engage inspection and testing service agencies, including independent testing laboratories that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located

1.7 REPORTS AND DOCUMENTS

A. The Prime Contractor's independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Written reports of each inspection, test, or similar service include, but are not limited to, the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

C. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located
2. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

3. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
4. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
5. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

B. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Prime Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and the Prime Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Prime Contractor.

C. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Prime Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Prime Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

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SECTION 01 4200 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Prime Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A request or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "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." Location is not limited.

E. "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.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. “Installer": An installer is the Prime Contractor or another entity engaged by the Prime Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and

scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Prime Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Prime Contractor.
    a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions

J. "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.

K. “Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 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

indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. 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.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.

APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	Association of the Wall and Ceiling Industry
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation)
CCC	Carpet Cushion Council

CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet and Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)

FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation (Now BWF)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.

ISO	International Organization for Standardization Available from ANSI
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association

NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute

RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc. (Now TCNA)
TCNA	Tile Council of North America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute

UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

C. 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.

IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.
UBC	Uniform Building Code (See ICC)

D. 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.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense

DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

E. 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) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)

FED-STD Federal Standard
(See FS)

FS Federal Specification
Available from Department of Defense Single Stock Point

Available from Defense Standardization Program

Available from General Services Administration

Available from National Institute of Building Sciences

FTMS Federal Test Method Standard
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards
Available from Department of Defense Single Stock Point

UFAS Uniform Federal Accessibility Standards
Available from Access Board

F. State 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.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation

CCR California Code of Regulations

CPUC California Public Utilities Commission

TFS Texas Forest Service: Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 5000 - TEMPORARY FACILITIES & CONTROLS – SINGLE PRIME CONTRACT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Temporary heat, dehumidification and cooling facilities.
4. Ventilation.
5. Telephone service.
6. Sanitary facilities, including drinking water.
7. Storm and sanitary sewer.

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Temporary roads and paving.
3. Dewatering facilities and drains.
4. Temporary enclosures.
5. Hoists and temporary elevator use.
6. Temporary project identification signs and bulletin boards.
7. Waste disposal services.
8. Rodent and pest control.
9. Construction aids and miscellaneous services and facilities.
10. Temporary Stairs
11. Internet/email access.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Barricades, warning signs, and lights.
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection.
5. Covered walkways
6. Tree and plant protection
7. Stormwater control.

8. Temporary enclosures and partitions.

1.3 DIVISION OF RESPONSIBILITIES

A. General: These Specifications assign each prime contractor specific responsibilities for certain temporary facilities used by other prime contractors and other entities at the site. The Contractor for General Construction is responsible for providing temporary facilities and controls that are not normal construction activities of other prime contractors and are not specifically assigned otherwise by the Architect.

B. Each contractor is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office, complete with necessary furniture, utilities (including internal power distribution from external disconnect box and meters), and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary enclosure of the building and temporary heat and dehumidification. Refer to Article 3.2E for temporary heating, cooling, dehumidification and ventilation requirements for Contractors.
6. All hoisting requirements including hoisting material or equipment into spaces below grade and hoisting requirements outside the building enclosure.
7. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
8. Secure lockup of its own tools, materials, and equipment.
9. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
10. Generators for powering welders and other equipment with loads in excess of available power supply.
11. Progress cleaning and waste disposal of its own areas on a daily basis.
    a. Progress cleaning shall include removal of waste as a result of demolition, new installments and packaging associated with new installation.
12. Any specific water service and pressure needs necessary for its own construction activities.

C. The Contractor for General Construction is responsible for but not limited to the following:

1. Temporary facilities and controls that are not otherwise specifically assigned to the HVAC Contract, Electrical Contract, and Plumbing Contract.
2. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
3. Temporary enclosure for building exterior, including moving of enclosure as required by phasing. Also including enclosure of Contractor parking and storage areas, except as indicated.

4. Excavation support and protection, unless required solely for the Work of another contract.
5. Project identification signs and temporary directional and safety signs.
6. General waste disposal facilities.
7. Pest control.
8. Temporary stairs.
9. Temporary fire-protection facilities.
10. Barricades, warning signs, and lights.
11. Site enclosure fence including around Contractor parking and storage area.
12. Covered walkways.
13. Security enclosure and lockup.
14. Environmental protection.
15. Maintenance and restoration of Owner's existing facilities used as temporary facilities including cleaning and sweeping.
16. GC to include the cost of the CM's job trailer in their bid.
17. Piped sewerage and drainage.
18. Piped gas service.
19. Piped water service.
20. Plumbing connections to existing systems and temporary facilities and controls furnished by other contractors.
21. Temporary water during construction
22. Temporary Heating, Cooling and Ventilation after building Permanent Enclosure and weathertight, excluding utility use charges.
23. Electric power service and distribution as necessary for construction.
24. Lighting, including site lighting.
25. Electrical connections to existing systems and temporary facilities and controls.
26. Electrical service to trailer.

1.4 USE CHARGES

A. General: Unless specifically indicated to be provided from the owner's metered system and without payment of use charges, cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. The Owner will not accept contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

    1. Owner's construction forces.
    2. Occupants of Project.
    3. Testing agencies.
    4. Personnel of authorities having jurisdiction.

B. Water Service: Use water from the Owner's existing water system without metering and without payment of use charges.

C. Electric Power Service: Use electric power from the Owner's existing or from new metered system without payment of use charges. Electric contractor shall furnish and install all temporary power service required for construction activities.

1. Electric power shall not be used for temporary heating from the Owner's system.
2. Electric power for welding shall not be provided.
3. Electric power requirements exceeding the capacity of the Owner's existing system shall be provided and paid for by the Contractor requiring same.

D. Temporary Toilet Facilities: Contractor will not be able to use the existing toilet facilities in the existing building. Contractor shall provide temporary toilets for all construction personnel.

E. Fuel for Temporary Heat: Fuel costs for temporary heat shall be paid as follows:
1. Renovation Construction - Temporary heat utilizing existing system currently metered by Owner: Fuel costs by Owner.

F. HVAC Service: General Contractor shall pay for all HVAC costs. Owner will not be responsible for any costs for operating temporary or permanent systems. HVAC Contractor must maintain, operate and extend equipment warranties as required to provide the Owner with a new clean system with all warranty periods in effect as required by the Contract Documents beginning from the date of project completion. If building is not enclosed, General Contractor will pay for all HVAC costs.

Existing Building: Contractor shall operate and maintain existing systems at all times or furnish temporary heat required for entire construction period as long as Contractor keeps building enclosed. Owner will pay for permanent system use charges only. Contractor must maintain, operate and extend equipment warranties as required to provide the Owner with a new clean system with all warranty periods in effect as required by the Contract Documents beginning from the date of project completion.

1.5 SUBMITTALS

A. Temporary Utilities: Each prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, each prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.

C. Shop Drawings and samples for verification: For temporary project identification sign, include the following information:

1. Sign design and details of construction.
2. Include dimensioned scale drawing indicating locations of text and size and location of graphic elements.
3. Font styles to be used, full size examples.
4. Color samples for each sign color indicated, not less than 3 inches square.

1.6 QUALITY ASSURANCE

A. Regulations: Each prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Each prime contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdictions.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

D. Temporary heat and dehumidifying equipment supplier qualifications: Engage a supplier experienced in supplying temporary heating and dehumidifying equipment and with the engineering and testing to recommend equipment sizes, predict fuel loads, predict humidity levels and test indoor air quality.

1.7 PROJECT CONDITIONS

A. Temporary Utilities: Each prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: The Installer of each permanent service shall assume responsibility for its operation, maintenance, and protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

1.8 SEQUENCING

A. Obtain permits for and install temporary project identification signs no later than 15 days after notice to proceed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: The contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thicknesses indicated.
3. For fences and vision barriers, provide minimum 3/8-inch- thick exterior plywood.
4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.

C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.

E. Paint: Comply with requirements of Division 9 Section "Painting."

1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
3. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.

F. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

G. Water: Provide potable water approved by local health authorities.

H. Open-Mesh Fencing: Provide 0.12-inch- thick, galvanized 2-inch chainlink fabric fencing 6 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts. Provide concrete bases for supporting posts.

2.2 EQUIPMENT

A. General: The prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

    1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

J. Internet/Email Access: Provide at least one member of contractors' management team actively working on this project with e-mail and Internet access.
   1. The contractor shall make available a list of important e-mail address to owner, construction manager, Architect, and Architect's consultants. Each contractor shall post e-mail list at each point of e-mail access. Contractor shall post e-mail list at Common Use Field Office.

K. Field Offices: Mobile units sized and equipped at the discretion of the Contractor. Units shall be kept clean, orderly and in good services.

   1. Contractor shall equip and maintain field office with the following:

      a. Telephone service with automated answering capabilities. Superintendents cellular phone service may serve this purpose.
      b. Internal electrical distribution system terminating at an exterior mounted weatherproof heavy duty NEMA 3R disconnect.

L. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled water drinking-water units, including paper cup supply.

   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature to 45 to 55 degrees F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Each prime contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

   1. Arrange with the company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
   3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. Contractors to provide specific water service and pressure needs necessary for its own construction activities.

1. Sterilization: Sterilize temporary water piping prior to use.
2. Provide rubber hoses as necessary to serve Project site.
3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.

1. Install electric power service underground, except where overhead service must be used.
2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 V, ac 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
3. Extend service to locations that serve all Contractors and all project construction areas.
4. Connect temporary service to Owner's existing power source, as directed by electric company officials, or to temporary or new service as it becomes available. Use of Owner's new electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner and all warranties are extended as required from the contract completion date.

   Electrical Contractor shall changeover from temporary to permanent at earliest feasible time and when acceptable to Owner. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

D. Temporary Lighting: When an overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
2. Provide one 100-w incandescent (or equivalent) lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-w incandescent (or equivalent) lamp every 50 feet in traffic areas.
4. Provide one 100-w incandescent (or equivalent) lamp per story in stairways and ladder runs, located to illuminate each landing and flight.

5. Install exterior site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

   At earliest feasible time, provide permanent lighting systems both inside the building and on the site for use in completing construction and lighting the project site. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

E. Temporary Heating, Cooling, Dehumidifying and Ventilation (hereafter referred to as HVAC): The General Contractor shall provide temporary HVAC required by construction activities, for curing or drying of completed installations, or protection of installed construction from adverse effects of low temperatures or high humidity except as noted below. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate requirements to produce the conditions required under "Temporary Facilities and Controls" and minimize consumption of energy.

   1. The General Contractor shall not be responsible for providing temporary heat in permanently unconditioned areas or in areas not scheduled for work to begin, unless the approved schedule is modified and accepted by the Owner and all Prime Contractors.
   2. The General Contractor shall provide all other Prime Contractors with the Project schedule and the minimum HVAC requirements to protect the Work as scheduled. If through no fault of any other Prime Contractor, the General Contractor does not maintain the original approved schedule, the General Contractor shall continue to provide temporary HVAC to other Prime Contractors when required.
   3. Prime Contractors are responsible to protect their work in unconditioned or unscheduled work areas at no additional expense to the Owner.
   4. Prior to the permanent HVAC system being operational, and when necessary for the proper execution of the work, the General Contractor shall provide, maintain, operate and pay all cost including fuel for sufficient required temporary HVAC to construct the building.
   5. New Construction Temporary/Permanent HVAC: The HVAC Contractor shall properly protect all HVAC equipment systems from construction air dust and debris beginning from initial installation. At 3 months before substantial completion of each phase of the building and as long as the building is enclosed (complete building envelope) in accordance with the project schedule with permanent roof, windows, walls, doors, etc., the HVAC Contractor shall provide, maintain and operate sufficient permanent heating/cooling. When the permanent heating or cooling system is used during this period, the HVAC Contractor shall professionally clean all HVAC systems. If the building is not enclosed, General Contractor shall continue to provide HVAC.

      a. Fuel and power requirements for temporary heating, dehumidification and cooling in areas of new construction shall remain responsibility of the GC until HVAC permanent system is utilized as noted above.

6. Renovation Areas Temporary/Permanent HVAC: In the existing building areas the HVAC Contractor shall operate and maintain existing systems at all times, as long as the building is enclosed as noted above, or furnish temporary HVAC or use new HVAC system for the entire construction period. HVAC Contractor must comply with all requirements for use of new systems to maintain and extend warranty as listed below. If building is not enclosed as noted above, General Contractor is responsible for HVAC system.

    a. Power requirements for temporary heating/cooling in areas of renovations shall be paid by the Owner.
        1. Electrical power demand for temporary heating/cooling in areas of renovations in excess of existing facilities capacity shall be provided by generators supplied, fueled and paid for by the HVAC Contractor.
        2. Fuel requirements for temporary heating/cooling in areas of renovations shall remain the responsibility of the GC until building is enclosed.

7. Portable heaters will not be acceptable during final finishing operations.
8. The permanent heating and exhaust system or any portion thereof may be used by the HVAC Contractor to provide temporary heat and exhaust as required for the proper prosecution of the work only when outside air is supplied directly to the system. The HVAC Contractor shall, when operating the permanent system do all servicing and adjusting to maintain the system in proper running order to prevent damage to the building or its equipment during the construction period.
9. When the Contractor performs startup and begins using the permanent HVAC systems, the Contractor must provide pre-filters and or other modifications to the systems necessary to prevent dirt, dust and other contaminants from entering the system. If measures implemented do not prevent dust from entering the systems, the HVAC Contractor shall perform cleaning of duct, coil and other HVAC components necessary to provide clean HVAC systems at Substantial Completion of the project.
10. Prior to turning over the permanent heating and ventilating system to the Owner, the HVAC Contractor shall thoroughly clean the system, provide new filters, make re-adjustments as required and bear all cost to place the system in first class operation condition. The warranty period of individual pieces of equipment of the permanent system used during the construction period shall be extended during the use period and the starting date used for determination of expiration for such warranties shall begin upon final acceptance of the project by the Owner.
    a. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

F. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel oil heaters with individual space thermostatic control.

    1. Use of gasoline-burning space heaters, open flame, or salamander-type heating units is prohibited.

G. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.

H. Toilets: Use of the Owner's existing toilet facilities will not be permitted.

I. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

1. Provide separate facilities for male and female personnel.

J. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

K. Drinking-Water Facilities: The Contractor for General Construction shall provide containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

1. Where power is accessible, the Electrical Contractor shall provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

L. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to the municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

M. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

O. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment:

1. Include distribution of power, including final connection, to exterior disconnect at each Contractor's temporary office. Distribution of power includes connection to Contractor's Field Trailers when located at interim locations and the relocation of power to final locations for these facilities.
2. Provide power as needed to serve each separate area of project.
3. Provide waterproof connectors to connect separate area lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
4. Provide warning signs at power outlets other than 110 to 120v.
5. Provide metal conduit, tubing or metallic cable for wiring exposed to possible damage.
6. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
7. Provide metal conduit enclosures or boxes for wiring devices.
8. Provide 4-gang outlets, spaced so 100-foot extension cord can reach area for power hand tools and task lighting. Provide a separate 125-v ac, 20-A circuit for each outlet.

P. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction for adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation and dehumidification requirements to produce ambient condition required and minimize energy consumption.
1. Humidity Range: Beginning from the earliest time of installation of casework, architectural woodwork or finishes, maintain between 25 and 55 percent relative humidity.

    a. Maintain interior relative humidity levels before this time as required to promote drying of concrete and concrete masonry substrates to produce moisture content and vapor emission levels that permit timely installation of finishes.

3.3 SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.

C. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.

D. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

1. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
2. Install temporary paving to minimize the need to rework the installations and result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
3. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
4. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 32 Sections. Where feasible, use the same facilities. Maintain the site, excavations, and construction free of water.
1)

1. Comply with regulations and responsibilities defined by the Erosion and Sedimentation Pollution Control permit. Fines associated with violations of permit shall be paid by the Contractor, and shall be at no cost to the Owner.
2. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
3. Before connection and operation of permanent drainage piping system, the Plumbing Contractor shall provide temporary drainage where roofing or similar waterproof deck construction is completed to a point 5 feet outside the building.
4. Remove snow and ice as required to minimize accumulations.

F. Temporary Enclosures: Provide temporary enclosure for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25-sq. ft. or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100-sq. ft. (9.2 sq. m) in area, use UL labeled fire-retardant-treated material for framing and main sheathing.

G. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Project Identification and Temporary Signs: The General Contractor shall provide an 8 feet by 4 feet by ¾ inch thick paint grade exterior plywood project identification sign, two 4 foot by 4 foot by ¾-inch thick paint grade exterior plywood sign with Architects and Construction Manager's logo, and five (5) 4 feet by 2 feet by ¾ inch thick temporary directional signs. Signs shall be mounted on 4 inch by 4 inch pressure treated posts. Posts shall be painted black. The project identification sign shall contain the name of the project, Contractors, and the design team. Signs shall be painted and lettered in four colors by a professional sign painter. Sign shall have Owner name and school logo. Project signs shall be located on the site where directed by Architect. Sign design, including text, layout and sign colors shall be provided by Architect. Exterior signs shall be in accordance with Township requirements. Erection shall not take place until an application, if required, is duly filed by the General Contractor and approved by the Township. No other signs or advertisements will be allowed on the premises.

I. Temporary Site Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

J. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

K. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

L. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

E. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
2. Provide plywood fence, 8 feet high, framed with four 2-by-4-inch rails, and preservative-treated wood posts spaced not more than 8 feet apart.

F. Covered Walkway: Where required by Authorities having jurisdiction, erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street, or where indicated on the Drawings. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails,

barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Architect.

G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid using tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

I. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding or erosion.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities. Provide temporary weather-tight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install temporary enclosures before time frames stated above when necessary to maintain interior relative humidity levels and temperatures as required to promote drying of concrete and concrete masonry substrates so that they achieve low enough moisture content and vapor emission levels to permit timely installation of finishes.
3. Vertical openings: Close opening of 25 sq. ft. or less with plywood or similar materials.
4. Horizontal openings: Close openings in floor or roof decks and horizontal surfaces with load bearing, wood-framed construction.
5. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

K. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2 –inch fire-retardant plywood on construction side.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weatherproof openings.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent system and service shall assume responsibility for operation, maintenance, and protection of each permanent system and service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

C. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

D. Maintenance: Maintain facilities and good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

E. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of each prime contractor. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

    a. Replace air filters and clean inside of ductwork and housings.
    b. Replace significantly worn parts and parts subject to unusual operating conditions.
    c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01 5000

SECTION 01 6000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Prime Contractor's selection of products for use in the Project.

1. Multiple Prime Contracts: Provisions of this Section apply to the construction activities of each Prime Contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 01 Section "Submittal Procedures" specifies requirements for submittal of the Prime Contractor's Construction Schedule and the Submittal Schedule.
3. Division 01 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the

United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate product list with the Prime Contractor's Construction Schedule and the Schedule of Submittals.
2. Form: Prepare product list with information on each item tabulated under the following column headings:

    a. Related Specification Section number.
    b. Generic name used in Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

    a. At the Prime Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

5. Architect's Action: The Architect will respond in writing to Prime Contractor within 2 weeks of receipt of the completed product list. No response within this period constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Prime Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each Prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.
2. If a dispute arises between Prime Contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
   Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.

2. Semiproprietary Specification Requirements: Where Specifications name two(2) or more products or manufacturers, provide one(1) of the products indicated. No substitutions will be permitted.

    a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Prime Contractor to use of these products only, the Prime Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

    a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.

8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 01 for allowances that control product selection and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 6000

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Division 01 Sections "Summary" for limits on use of Project site.
2. Division 01 Section “Closeout Procedures” for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed

construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field

measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

3.4 FIELD ENGINEERING

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 "Quality Requirements"

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 7300

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SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Field verify existing conditions prior to proceeding with the work - Notify the Architect in writing of any conditions that are significantly different from those indicated on the drawings. Adjust work in accordance with the Architect's instructions.

B. This Section includes administrative and procedural requirements for cutting and patching.

Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

    a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.
b. Bearing and retaining walls.
c. Structural concrete.
d. Structural steel.
e. Lintels.
f. Timber and primary wood framing.
g. Structural decking.
h. Stair systems.
i. Miscellaneous structural metals.
j. Exterior curtain-wall construction.
k. Equipment supports.
l. Piping, ductwork, vessels, and equipment.
m. Structural systems of special construction in Division 13 Sections.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment.
b. Air or smoke barriers.
c. Water, moisture, or vapor barriers.
d. Membranes and flashings.
e. Fire protection systems.
f. Noise and vibration control elements and systems.
g. Control systems.
h. Communication systems.
i. Conveying systems.
j. Electrical wiring systems.

k. Operating systems of special construction in Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.

a. Processed concrete finishes.
b. Stonework and stone masonry.
c. Ornamental metal.
d. Matched-veneer woodwork.
e. Preformed metal panels.
f. Firestopping.
g. Window wall system.
h. Stucco and ornamental plaster.
i. Acoustical ceilings.
j. Terrazzo.
k. Finished wood flooring.
l. Fluid-applied flooring.
m. Carpeting.
n. Aggregate wall coating.
o. Wall covering.
p. HVAC enclosures, cabinets, or covers.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining

portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01 7329

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SECTION 01 7423 - FINAL CLEANING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for final cleaning at Substantial Completion.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Special cleaning requirements for specific construction elements are included in appropriate Sections.

C. Multiple Prime Contracts: Each Prime Contractor is responsible for final cleaning his own Work. The Lead Contractor is responsible for coordinating final cleaning of an area or piece of equipment where more than one Prime Contractor is involved.

D. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and antipollution regulations.

1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final-cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.
2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
3. Remove petrochemical spills, stains, and other foreign deposits.
4. Remove tools, construction equipment, machinery, and surplus material from the site.
5. Remove snow and ice to provide safe access to the building.
6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
8. Broom clean concrete floors in unoccupied spaces.
9. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo, if required.
10. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
11. Remove labels that are not permanent labels.
12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
16. Clean ducts, blowers, and coils if units were operated without filters during construction.
17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.

18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
19. Leave the Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01 7423

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SECTION 01 7700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections, where applicable.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following: List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion if claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

    a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise Owner of pending insurance change-over requirements.
3. Obtain and submit release enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
4. Submit record drawings, damage or settlement survey, and similar final record information.
5. Complete final clean-up requirements.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following: List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an update final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Design Professional's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Design Professional.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Design Professional's reference during normal working hours.

B. Record of Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location of the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to

substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Design Professional for the Owner's records.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.2 FINAL CLEANING

A. General: General cleaning during Demolition is required.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Clean exposed exterior and interior hard-surfaced finishes to Pre-Demolition condition. Leave floors broom clean.
b. Clean the site of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth, even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

E. Reestablishment of the Work Area

1. Replace any window glass which was temporarily removed, using approved setting methods. Clean both sides of window glass.

2. Reestablish local HVAC, mechanical and electrical systems in proper working order where needed.

3. Repair any damage that occurred as a result of demolition activities.

F. Project Close-Out

1. Within not more than twenty (20) days of the date of Substantial Completion and prior to the time that any final payment shall become due to the Prime Contractor, the Prime Contractor shall furnish to the Architect all certifications, test reports, disposal manifests and other documentation duly completed in accordance with the requirements of the Contract Documents and any applicable Federal, State or Local law.

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.
3. Instruction of the Owner's operating personnel in the operation and maintenance of building systems and equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Submittals" specifies preparation of Shop Drawings and Product Data.
2. Division 01 Section "Contract Closeout" specifies general closeout requirements.
3. Appropriate Sections specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

C. Multiple Prime Contracts: Preparation of operation and maintenance manuals includes collecting material, collating and binding material, and submitting data. Each Prime Contractor shall prepare operation and maintenance data for its own installations.
1. Where operation and maintenance manuals include information on installations by more than one Prime Contractor, the Prime Contractor who is the principal source of information, as determined by the Architect, shall receive information furnished by other contractors and prepare the manuals.
2. Where instruction in operation and maintenance procedures on equipment and systems involves participation of more than one Contractor, the Prime Contractor designated by the Architect as the principal instructor shall coordinate with the other contractors for a mutually agreeable time to provide instruction to the Owner's operation and maintenance personnel.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit 2 draft copies of each manual to the Architect for review. Include a complete index or table of contents of each manual.

    a. The Architect will return 1 copy of the draft with comments within 15 days of receipt.

2. Submit 1 copy of data in final form at least 15 days before final inspection. The Architect will return this copy within 15 days after final inspection, with comments.
3. After final inspection, make corrections or modifications to comply with the Architect's comments. Submit the specified number of copies of each approved manual to the Architect within 15 days of receipt of the Architect's comments.

B. Form of Submittal: Prepare all operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Provide the Owner with a “CD” (or more as suitable) of PDF or other approved format files. Organize in a similar manner as a paper manual, with logical folders and sub-folders, and descriptive file names. When the Owner requests paper manuals, organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder for paper submittal.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch (115-by-280-mm) paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
4. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.

    a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
    b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:
    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.

5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.

12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:

    a. Subject matter covered by the manual.
    b. Name and address of the Project.
    c. Date of submittal.
    d. Name, address, and telephone number of the Prime Contractor.
    e. Name and address of the Architect.
    f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

    a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information Section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.

4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.

    a. Do not use original project record documents as part of operation and maintenance manuals.

7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit three (3) copies of each paper manual, in final form, on material and finishes to the Architect for distribution. Provide one section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.

1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:

    a. Manufacturer's catalog number.
    b. Size.
    c. Material composition.
    d. Color.
    e. Texture.
    f. Reordering information for specially manufactured products.

2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to the Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.

1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

    a. Applicable standards.
    b. Chemical composition.
    c. Installation details.
    d. Inspection procedures.
    e. Maintenance information.
    f. Repair procedures.

D. Schedule: Provide complete information in the materials and finishes manual on products specified in the following Sections:

1. Section 04 2000 – Unit Masonry Assembly
2. Section 05 5200 – Handrails and Railings
3. Section 07 1300 – Self Adhering Sheet Waterproofing
4. Section 07 5323 – EPDM Single Ply Membrane Roofing
5. Section 08 4114 – Aluminum-Framed Entrances and Storefronts
6. Section 08 7100 - Door Hardware
7. Section 08 8000 - Glazing
8. Section 09 6800 - Carpeting

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit six (6) copies of each manual, in final form, on equipment and systems to the Architect for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

    a. Equipment or system function.
    b. Operating characteristics.
    c. Limiting conditions.
    d. Performance curves.
    e. Engineering data and tests.
    f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:

    a. Printed operation and maintenance instructions.
    b. Assembly drawings and diagrams required for maintenance.

c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

   a. Routine operations.
   b. Troubleshooting guide.
   c. Disassembly, repair, and reassembly.
   d. Alignment, adjusting, and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

   a. Startup procedures.
   b. Equipment or system break-in.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Instructions on stopping.
   f. Shutdown and emergency instructions.
   g. Summer and winter operating instructions.
   h. Required sequences for electric or electronic systems.
   i. Special operating instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

7. Coordination Drawings: Provide each Prime Contractor's Coordination Drawings.
   a. Provide as-installed, color-coded, piping diagrams, where required for identification.

8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.

9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:
   a. Electric service.
   b. Controls.
   c. Communication.

C. Schedule: Provide complete information in the equipment and systems manual on products specified in the following Sections:
   1. Pipe Markers: Section 22 0553 – Identification for Plumbing and Equipment, Section 23 0553 – Indentification for HVAC Piping and Equipment.
   2. Air-Handling Units: Section 23 7313 Modular Indoor Central-Station Air-Handling Units.
   3. Fans: Section 23 3413 – Vane Axial Fans.

4. Diffusers: Section 23 3713 – Air Outlets and Inlets
5. Lighting fixtures: Section 26 5100 – Interior Lighting, Section 26 5600 – Exterior Lighting.
6. Telephones: Section 27 1300 – Voice and Data Structured Cabling System

4.1 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

END OF SECTION 01 7823

SECTION 01 7836 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Prime Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Submittal Procedures" specifies procedures for submitting warranties.
2. Division 01 Section "Contract Closeout" specifies contract closeout procedures.
3. Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Prime Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Prime Contractor.

D. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own contract.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Prime Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Prime Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Prime Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Prime Contractor, or the Prime Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

C. Forms for special warranties are included at the end of this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Prime Contractor, or by the Prime Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 02 through 28 Sections for specific content requirements and particular requirements for submitting special warranties.

D. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Prime Contractor, or by the Prime Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Prime Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 7863

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SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

C. Multiple Prime Contracts: Each Prime Contractor is responsible for obtaining, maintaining, and recording Project Record Document information for its own Work. The Lead Contractor is responsible for coordinating information, where information from more than one Prime Contractor is to be integrated with information from other Prime Contractors to form one combined record.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Final Submittal:

1) Submit PDF electronic files of scanned record prints and one set of prints.
2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 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. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:
a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: 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 Architect for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

PART 3 - EXECUTION

3.1 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.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 7839

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and 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 Prime Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

   a. Instructions on meaning of warnings, trouble indications, and error messages.

b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Prime Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Prime Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

C. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

D. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 7900

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SECTION 02 4119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at **Project site**.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Pre-demolition: Obtain Confirmation that the owner has taken Photographs or Video before Work begins.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Contractor shall remove the following item(s) for relocation per the construction documents.

a. Emergency generator.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner’s representative will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 4119

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
2. Freestanding exterior stairs.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Concrete Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified floor and slab flatness and levelness.
l. Concrete repair procedures.
m. Concrete protection.

n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
o. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Color pigments.
10. Vapor retarders.
11. Liquid floor treatments.
12. Curing materials.

a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

13. Joint fillers.
14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.

13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

D. Samples: For manufacturer's standard colors for color pigment.

E. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Bonding agents.
5. Adhesives.
6. Vapor retarders.
7. Joint-filler strips.
8. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Aggregates.

6. Admixtures:

   a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Research Reports:

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.

   1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

   1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

   1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

   2. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

D. Mockups: Cast concrete formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

   1. Formed Surfaces: Build panel approximately 100 sq. ft. (9.3 sq. m) in the location indicated or, if not indicated, as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

F. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

    a. Concrete mixture design.
    b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete paving subcontractor.

3.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

    a. Admixture dosage rates.
    b. Slump.
    c. Air content.
    d. Seven-day compressive strength.
    e. 28-day compressive strength.
    f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).

3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

B. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

C. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

D. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.4 STAIR NOSINGS

1. General:

    a. Base: Extruded heat treated aluminum alloy 6063-T6
    b. Abrasive Filler: mixture of aluminum oxide and silicon carbide granules in an epoxy matrix.
    c. Color: As selected by Architect from manufacturer’s full selection.

2. Basis of Design Product:

    a. American Safety Tread Model Number TP-311

2.5 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, white.
2. Fly Ash: ASTM C618, Class C or F.

3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Retarding Admixture: ASTM C494/C494M, Type B.
2. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
3. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
4. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
5. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
6. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.

F. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments, color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. LM Scofield
2. Butterfield Color

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.
b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
c. Ambient Temperature Above 85 deg F (29 deg C): White.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 40 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

E. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXTURES

A. Class AA: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 (ACI 318M).
2. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
4. Air Content:

a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch (25-mm) nominal maximum aggregate size.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

1. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
5. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

3.4 FORMWORK

A. Forms: Forms shall be constructed of approved material. Material shall be chosen based on strength and concrete finish requirements.

B. Design: Formwork shall be designed for loads and lateral pressures outlined in Chapter 1, Recommended practice for Concrete Formwork (ACI 347). Formwork design and construction are the responsibility of the Contractor.

3.5 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.6 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Concrete Steps.

1. Apply a smooth tooled finish to non-traffic portions of the steps, including nosings, risers and sides.

2. Apply the specified broom finish perpendicular to the line of travel on the stair treads and landings.
3. Ensure that any reinforcing steel is set on chairs and firmly wired in place.

D. Interior concrete is to be finish:
1. Apply float finish to surfaces to be covered with fluid-applied or sheet waterproofing, or sand-bed terrazzo.
2. Apply a trowel finish to surfaces exposed to view.

E. Exterior concrete finish:
1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.

a. Continue reinforcement across construction joints unless otherwise indicated.
b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Space vertical joints in walls. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).

a. Do not use vibrators to transport concrete inside forms.

b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306.1.

H. Hot-Weather Placement: Comply with ACI 301.

3.10 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
b. Remove projections larger than 1 inch (25 mm).
c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

a. Patch voids larger than 1/4 inch (6 mm) wide or 1/2 inch (13 mm) deep.
b. Remove projections larger than 1/4 inch (6 mm).
c. Patch tie holes.
d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
e. Locations: Apply to concrete surfaces exposed to public view,.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:

a. Perform no later than one day after form removal.
b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
d. Maintain required patterns or variances as shown on Drawings or to match mockups.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes and as indicated on Architectural documents.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo and as indicated on Architectural drawings.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system and as indicated on Architectural documents.
2. Finish on-grade and supported surfaces to the applicable minimum following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface. The contractor shall supply floor leveling material and other corrective measures in areas where floor finish provisions exceed the flatness and levelness requirements. **Per ACI 302.1R, F(L) requirements**

should only be applied to slabs-on-ground that are level and suspended slabs that are both level and shored.

a. For carpeted slabs, specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
b. For thin floor coverings, specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
c. For thin floor coverings, specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
d. For very flat floors for high-speed forklifts, air pallets, and ice and roller rinks, specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method and as indicated on Architectural documents. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
2.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.12 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases as indicated on the Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

3.13 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

3.14 TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch (19 mm).
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

    a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

        1) Project name.
        2) Name of testing agency.
        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
        4) Name of concrete manufacturer.
        5) Date and time of inspection, sampling, and field testing.
        6) Date and time of concrete placement.
        7) Location in Work of concrete represented by samples.
        8) Date and time sample was obtained.
        9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

1. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of three laboratory-cured specimens at seven days and one set of two specimens at 28 days.
    b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

2. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
3. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test

value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).

4. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
5. Additional Tests:

    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.

6. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
7. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

E. Protect concrete surfaces until all adjacent installations are complete.

END OF SECTION

SECTION 03 5413 - GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Self-leveling, gypsum cement underlayment for application below interior floor coverings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum cement underlayment.
2. Reinforcement.
3. Primer.
4. Surface sealer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

PART 2 - PRODUCTS

2.1 GYPSUM CEMENT UNDERLAYMENTS

A. Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in minimum uniform thickness of 1/8 inch to match adjacent floor elevations.
   1. USG Level Rock gypsum floor underlayment or approved equal meeting the specified performances.
   2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C219.
   3. Compressive Strength: Not less than 2500 psi at 28 days when tested according to ASTM C472.
   4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.

   1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

F. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrate according to manufacturer's written instructions.

   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

1. Install underlayment reinforcement recommended in writing by manufacturer.

C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond; prepare surfaces according to manufacturer's written instructions.

D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.2 INSTALLATION

A. Mix and install underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment installation and for time period after installation recommended in writing by manufacturer.
2. Coordinate installation of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Install underlayment to produce uniform, level surface.

1. Install a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during installation and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.3 INSTALLATION TOLERANCES

A. Finish and measure surface, so gap at any point between gypsum cement underlayment surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/16 inch (1.6 mm) in 2 feet (610 mm).

END OF SECTION 03 5413

SECTION 04 2000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.

2. Clay masonry units (sitewall cap)
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.

C. Related Sections:

1. Section 03 3000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 05 5000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
4. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
5. Section 32 14 43 "Unit Pavers" for exterior unit masonry paving.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement elevations of reinforced walls.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:
1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required. Submit face brick to show range of colors, texture and mortar types for matching existing brick. Submit concrete masonry samples to illustrate texture.

2. Face Brick: Submit range of colors proposed for matching mortar and brick at existing to new interfaces.
3. Colored mortar.

D. Samples for Verification: For each type and color of the following:

1. Exposed Decorative CMUs.
2. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
3. Stone trim.
4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
5. Weep holes and vents.
6. Accessories embedded in masonry.

1.7 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties and material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.
d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing per ASTM C 67.
e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.

3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for each type of exposed unit masonry construction in sizes approximately 72 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.

    a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.

b. Include lower corner of window opening framed with trim at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
d. Include studs, sheathing, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bull nose-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK COPING

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

B. Face Brick: Facing brick complying with ASTM C 216

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   Basis of Design: Glen-Gery Burlesque Glazed Series, Hanley Plant.

C. Properties:
1. Type: Facebrick (Sitewall coping)
2. Size: 3 5/8” x 2 ¼” x 8”
3. Color: ‘White’
4. Style: Glazed
5. Texture/Finish: Smooth

6. Grade: SW.
7. Type: FBS.
8. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4150 psi.
9. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.

10. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand.
4. Colored-Mortar Aggregates: Natural sand of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
   b. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

G. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot dipped galvanized steel.
3. Wire Size for Side Rods: As indicated or 0.187-inch diameter.
4. Wire Size for Cross Rods: As indicated or 0.148-inch diameter.
5. Wire Size for Veneer Ties: As indicated or 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches wide, plus 1 side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, stainless-steel continuous wire.

2.9 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
5. Stainless-Steel Sheet: ASTM A 666, Type 304.
6. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
7. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 304.

B. Corrugated Metal Ties: Not Permitted

C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes do not align are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch- diameter, stainless-steel wire.

E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, stainless-steel wire.

F. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 01.05-inch- thick, steel sheet, galvanized after fabrication.

    a. 0.064-inch- thick, galvanized sheet may be used at interior walls unless otherwise indicated.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, stainless-steel wire.
3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch- thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

    a. 0.064-inch- thick, galvanized sheet may be used at interior walls unless otherwise indicated.

G. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from stainless steel.

H. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated bent to configuration indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

I. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Heckmann Building Products Inc.; 315-D with 316 or Pos-I-Tie.
      2) Hohmann & Barnard, Inc.; DW-10 DW-10HS or DW-10-X.

   b. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
   c. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 3-5/8 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.
   d. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
   e. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.

4. Slip-in, Masonry-Veneer Anchors: Units consisting of a wire tie section and an anchor section designed to interlock with metal studs and be slipped into place as sheathing is installed.

   a. Products: Subject to compliance with requirements, provide the following:

      1) Hohmann & Barnard, Inc.; AA308.

b. Wire-Type Anchor: Bent wire anchor section with an eye to receive the wire tie. Wire tie has a vertical leg that slips into the eye of anchor section and allows vertical adjustment. Both sections are made from 3/16-inch, hot-dip galvanized wire.

5. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

a. Products: Subject to compliance with requirements, provide the following:

1) ITW Buildex; Teks Maxiseal with Climaseal finish.
2) Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

6. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.

a. Products: Subject to compliance with requirements, provide the following:

1) Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener.
2) ITW Buildex; Scots long life Teks.

2.10 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Postinstalled Anchors: chemical anchors.

1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.11 EMBEDDED FLASHING MATERIALS

. Flexible flashing:

1. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics, except as modified below, are acceptable for use, subject to compliance with specified requirements.

   a. Product standard of quality:
      1. York Manufacturing, Inc.; York 304 SA SS
      2. GE Silicones, Inc.; GE Elemax SS Flashing
      3. Vapro Shield, Inc.; VaproThru-Wall Flashing SA

2. Characteristics:
   a. Type: stainless steel core with one uncoated (bare) stainless steel face (outward facing) with a butyl block copolymer adhesive (inward facing).

b. Stainless steel: type 304, ASTM A240.

a. Adhesive: block copolymer
d. No primer required.
e. UV resistant.
f. 20-year warranty.
g. Fire resistant: ASTM E84 Class A material.
h. Mold resistant: passes ASTM D3273.
i. Passes AAMA 711-20.
j. Passes air barrier material test: ASTM E2178-13.
k. Contributes towards LEED by satisfying EA Credit 1 (optimize energy performance) and EQ Credit 4.1 (low emitting materials)
l. Size: Manufacturer's standard width rolls.

Accessories:

1. Polyether sealant:
   1) York Manufacturing, Inc.; UniverSeal US-100
   2) STS Coatings; GreatSeal LT-100
   3) Prosoco, Inc.; R-Guard Joint Seam Sealer
2. Splice Tape:
   1) York Manufacturing, Inc.; York 304 SA
   2) GE Silicones, Inc.; GE Elemax SS Flashing
   3) VaproShield, Inc.; Vapro Thru-Wall Flashing SA
3. Corner and End Dams: form the stainless steel flashing in the field or use 26 gauge stainless steel pre-manufactured corners.
4. Mortar deflection: polyester strands that will not degrade and keep the weep vents from clogging with mortar.
   1) York Manufacturing; Weep-Armor
   2) Or approved comparable product
5. Termination bar: rigid PVC or stainless steel termination bar with sealant catch lip
   1) York Manufacturing, Inc.; T-96 termination bar
   2) York Manufactuirng, Inc.; SS Term Bar

A. Metal Flashing: Provide metal flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Location: Flashing under exterior stone caps: Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cheney Flashing Company; Cheney 3-Way Flashing Sawtooth.
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
        3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge where unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
6. Fabricate through-wall flashing with sealant stop where unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
8. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

2) CavClear Weep Vents
3) Hohmann and Barnard, Inc.- Quadro-Vent

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Building Products Inc.; Mortar Break II.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

2. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 1 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.13 FOUNDATION WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, closed-cell product extruded with an integral skin.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.14 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. ProSoCo, Inc.

b. Diedrich Technologies, Inc.
c. EaCo Chem, Inc.

2.15 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use masonry cement or mortar cement mortar unless otherwise indicated.
3. For exterior masonry, use masonry cement or mortar cement mortar.
4. For reinforced masonry, use masonry cement or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For Brick, Use Type N.
5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
6. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Mix to match Architect's sample.
3. Application: Use pigmented mortar for exposed mortar joints with the following units:
   a. Face brick.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns,

and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond and/or bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 24 inches o.c. unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set stone cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.

B. Bond wythes of composite masonry together using bonding system indicated on Drawings.

C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

D. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls, except cavity walls , and interior walls and partitions.

E. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

F. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 16 inches o.c.
2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.

b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
4. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

E. Coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing."

F. Apply air barrier to face of backup wythe to comply with Section 072726 "Fluid-Applied Membrane Air Barriers."

G. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[corners,] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
3. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
5. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch Insert minimum width for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
8. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
9. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches above top of pea gravel.

G. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

H. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.16 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.17 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

1. **Special Project Note**: Surfaces scheduled for Plaster/Stucco finish shall have joints cut flush with face of masonry units.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.18 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 04 4200 - EXTERIOR STONE CLADDING AND SITE WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone panels set with individual anchors attached to CMU
2. Stone wall constructed set without anchors

B. Related Requirements:

1. Division 09 for Interior slate sills

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.

1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
2. Show locations and details of anchors and backup structure.

C. Stone Samples: Sets for each variety, color, and finish of stone required; not less than 12 inches (300 mm) square.

D. Colored Pointing Mortar Samples: For each color required.

E. Sealant Samples: For each type and color of joint sealant required.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical exterior wall area and site walls.

2. Sample walls may be part of the finished construction.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

C. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F (5 deg C) or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C1242.

1. Stone anchors withstand not less than two times the weight of the stone cladding in both compression and tension.

B. Structural Performance: Stone cladding assembly withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Wind Loads: As indicated.

2.2 GRANITE

A. Material Standard: Comply with ASTM C615/C615M.

B. Varieties and Sources: Subject to compliance with requirements, [provide the following] [provide one of the following] [available stone varieties that may be incorporated into the Work include, but are not limited to, the following]:

1. <Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers>.

C. Finish: [Polished] [Honed] [Thermal] [As indicated].

D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 PENNSYLVANIA BLUESTONE

A. Material Standard: Comply with ASTM C568/C568M.

1. Classification: III High-Density except as follows: absorption, 5 percent by weight maximum; density, 150 lb/cu. ft. minimum; compressive strength, 20,000 psi minimum; and modulus of rupture 800 psi (5.5 MPa) minimum.

B. Source in north eastern Pennsylvania

If retaining "Description" Paragraph below, retain one of three options. Coordinate with option retained in "Classification" Subparagraph. Description can serve as a salient characteristic if varieties other than those named are allowed and can be deleted if only specific named varieties are allowed.

C. Description: Sandstone “Pa Bluestone”

D. Varieties and Sources: Subject to compliance with requirements, provide the following
   1. Stone source in north eastern Pennsylvania

   2. Grade and Color: Standard, blue-gray

Retain last option in "Finish" Paragraph below for Indiana limestone.

E. Finish: Themal finish

2.4 QUARTZ-BASED STONE FIELD STONE

Retain one of first three options in "Material Standard" Paragraph below; for bluestone, retain third option.

A. Material Standard: Comply with ASTM C616/C616M, Classification II Quartzitic Sandstone

B. Varieties and Sources: Subject to compliance with requirements, provide available stone varieties that may be incorporated into the work include, but are not limited to, the following:

   1. Beth-Hanover Supply Co, Bethlehem Pa or approved equal.

C. Finish: Natural cleft

2.5 BACKUP STRUCTURE

1. Concrete masonry units. Refer to Div 04 spec section.

2.6 ANCHORS AND FASTENERS

A. Fabricate anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A276, Type 304

B. Fabricate shelf angles for bluestone from hot-dip galvanized steel, ASTM A36/A36M for materials and ASTM A123/A123M for galvanizing.

C. Postinstalled Anchor Bolts for Concrete and Masonry: torque-controlled expansion anchors made from stainless steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Alloy Group A1 or A4) for bolts and nuts; ASTM A240/A240M, ASTM A276, or ASTM A666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488/E488M, conducted by a qualified independent testing agency.

2.7 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207.

C. Aggregate: ASTM C144, 100 percent pass No. 16 sieve.

D. Water: Potable.

2.8 STONE ACCESSORIES

A. Setting Shims: Strips of [resilient plastic] [or] [vulcanized neoprene, Type A Shore durometer hardness of 50 to 70], nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch (0.4 mm) thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."

C. Weep and Vent Tubes: [Medium-density polyethylene tubing, 1/4-inch of length required to extend from exterior face of stone to cavity behind.

D. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:

E. Preformed Joint Seals: Preformed [silicone] [foam] joint seals that comply with applicable requirements in Section 079100 "Preformed Joint Seals" and do not stain stone.

2.9 FABRICATION OF STONE

A. Control depth of stone and back check to maintain minimum clearance of [1 inch (25 mm)] [1-1/2 inches (38 mm)] <Insert dimension> between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

B. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

C. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

D. Finish exposed faces and edges of stone[, except sawed reveals,] to comply with requirements indicated for finish and to match approved samples[and mockups].

E. Cut stone to produce uniform joints 1/4 inch wide and in locations indicated.

F. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

G. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

2.10 MORTAR MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions. Do not use admixtures, unless otherwise indicated.

B. Portland Cement-Lime Setting Mortar: Comply with ASTM C270, Proportion Specification, Type N.

PART 3 - EXECUTION

3.1 INSTALLATION OF MECHANICALLY ANCHORED STONE CLADDING

A. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C1242.

B. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

C. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point

loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.2 INSTALLATION OF STONE CLADDING WITH MORTAR

A. Set stone in full bed of mortar with head joints filled unless otherwise indicated.

1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

B. Embed ends of sills in mortar; leave remainder of joint open until final pointing.

C. Rake out joints for pointing with mortar to depths of not less than 1/2 inch (12 mm). Rake joints to uniform depths with square bottoms and clean sides.

D. Point stone joints by placing pointing mortar in layers not more than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

E. Tool joints with a round jointer having a diameter 1/8 inch (3 mm) larger than width of joint, when pointing mortar is thumbprint hard.

F. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing, but not less than 1/2 inch (12 mm). Rake joints to uniform depths with square bottoms and clean sides.

3.3 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet.

B. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less.

C. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units.

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.

B. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 04 4200

SECTION 05 1200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
4. Division 05 Section "Metal Stairs."
5. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use ASD; data are given at service-load level.

B. Moment Connections: Type PR, partially and FR, fully restrained.

C. Construction: As indicated on Contract Documents.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all steel erection drawing shop drawings.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, Fabricator, Professional Engineer, and Testing Agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M

B. Channels, Angles: ASTM A 36/A 36M

C. Plate and Bar: ASTM A 36/A 36M

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: As indicated on documents.
2. Finish: Black, except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

1. -Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Unheaded Anchor Rods: ASTM F1554, Grade 36 (ASTM F1554 Grade 55, weldable can be substituted for Grade 36) or as indicated on documents.

1. Configuration: Straight and threaded with nut for anchorage.
2. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
5. Finish: Plain

F. Headed Anchor Rods: ASTM F 1554, Grade 36 (ASTM F 1554, Grade 55, weldable can be substituted for Grade 36) straight with heavy-hex head, or as indicated on documents.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
3. Washers: ASTM F 436 (ASTM F 436M) Type 1, hardened carbon steel.
4. Finish: Plain

G. Threaded Rods: ASTM A 36/A 36M

1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
2. Washers: ASTM F 436 (ASTM F 436M) Type 1, hardened
3. Finish: Plain

H. Expansion Anchors: Type and size as indicated on documents. Wedge type, torque-controlled, with impact section to prevent thread damage and wedge ridges to prevent spinning during installation, complete with required nuts, washers, and manufacturer's installation instructions. All expansion anchors shall be equipped with length identification markings.

1. Interior Use: For use in conditioned environments free from potential moisture, provide carbon steel anchors with zinc plating in accordance with ASTM B633.
2. Exposed Use: In exposed, potentially wet, or otherwise corrosive environment, provide anchors of Type 304 or Type 316 stainless steel with stainless steel nuts, and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded faster. All nuts shall conform to ASTM A563 Grade A unless otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.
3. Products: Provide the following:
    a. Hilti Kwik Bolt TZ Expansion Anchor for installation into concrete.
    b. Hilti Kwik Bolt III Expansion Anchor for installation into masonry.

I. Cartridge Injection Adhesive Anchors and rebar doweling: Threaded steel rod or inserts, complete with nuts, washers, polymer, cementitious, epoxy, or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on documents.

1. Interior Use: For use in conditioned environments free from potential moisture, provide threaded carbon steel rods conforming to ISO898, ASTM A36, or ASTM A 193, Grade B7 as indicated on documents.

2. Exposed Use: In exposed, potentially wet or otherwise corrosive environments provide stainless steel anchors, nuts, and washers in accordance with ASTM F593. Provide nuts and washers with matching alloy group and minimum poof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform with ASTM F594 unless other otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.
3. Products: Provide the following:

    a. Hilti HAS or HIT threaded rods or rebar (by others) with Hilti HIT HY-150 Adhesive for anchorage to masonry or stone. Hilti HIT HY-20 Adhesive System for anchorage to brick or concrete masonry (with screen tubes).
    b. Hilti HAS, HIS threaded rods or rebar (by others) for doweling with Hilti HIT-RE 500-SD Adhesive Anchoring System for anchorage to concrete.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer, complying with MPI #79 and compatible with topcoat unless otherwise indicated on documents or in Division 09.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members with reinforcing as indicated on documents.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning", unless indicated otherwise on documents or in Division 09.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frames and/or located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with Steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations, to elevations indicated, and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

D. Splice members only where indicated.

E. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field fillet welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, all suspect field fillet welds and all field full/partial penetration welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.
   2. Ceiling joist framing.
   3. Soffit framing.

B. Related Requirements:

   1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
   2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
   3. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dietrich Metal Framing; Clarkwestern Dietrich Building Systems LLC.
2. Marino/WARE.
3. Nucornsteel, A Nucor Company.
4. Steel Network Inc. (The).
5. The Steel Network, Inc; Head of Wall.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on the structural drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height with a maximum value of 1/4".
   b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0451 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass and/or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ClarkDietrich Building Systems.
b. Dietrich Metal Framing; Clarkwestern Dietrich Building Systems LLC.
c. Marino/WARE.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0538 inch.
b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0538 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 2 inches, minimum.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 2 inches, minimum.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.7 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch.
2. Flange Width: 2 inches , minimum.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Loose bearing and leveling plates.
2. Loose steel lintels.
3. Shelf angles.
4. Steel framing and supports for operable partitions.
5. Steel framing and supports for countertops.
6. Steel framing and supports for mechanical and electrical equipment.
7. Miscellaneous metal trim.
8. Roof Ladders
9. Elevator pit ladder
10. Metal Floor plate and supports
11. Steel Bollards

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.

2. Division 5 Section "Metal Pan Stairs and Ramps" for interior stair and elevated ramps system components.

3. Division 5 Section "Ornamental Handrails and Railings" for ornamental metal handrails and railings fabricated from stock components.

4. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.

3. Grout.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples: For each type and finish of extruded

D. Mill Certificates: Mill Certificates: Signed by manufacturers of steel sheets certifying that products furnished comply with requirements

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

F. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

G. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- (14.3-mm-) wide slotted holes in webs at 2 inches (51 mm) o.c.

1. Width of Channels: 1-5/8 inches
2. Depth of Channels: 1-5/8 inches
3. Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; 0.064-inch (1.6-mm) nominal thickness.
4. Finish: Hot-dip galvanized after fabrication.

H. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

I. Gray-Iron Castings: ASTM A 48, Class 30 (ASTM A 48M, Class 200), unless another class is indicated or required by structural loads.

J. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329

J. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

K. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.7 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates where indicated after fabrication.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.9 STEEL WELD PLATES AND ANGLES

A. Provide weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm)

bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

C. Galvanize shelf angles to be installed in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
3. Furnish inserts if units must be installed after concrete is placed.

C. Fabricate supports for operable partitions as follows:

1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:

1. Exterior

2.13 METAL BOLLARDS

1 Fabricate metal bollards from Schedule 40 steel pipe

2 Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve. Prime with zinc-rich primer.

2.14 ROOF HATCH ACCESS LADDER

1. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum and ASTM B209, Alloy 6063 Temper T-6 sheet aluminum.

2. Aluminum Finish: Mill finish.

3. Accommodation Height: As indicated on the Drawings.

4. Angle of Inclination: 75 degrees.

5. Treads: 6 inches (152 mm) wide by 1-3/4 inches (45 mm) deep by 24 inches (610 mm) long aluminum channel shaped section. Equally space treads. Connect treads to stringers with bolts to allow for future replacement.

6. Tread Surface: Corrugated.

7. Tread Surface: Abrasive filled.

8. Stringers: 6 inches (152 mm) by 2 inches (50 mm) aluminum channel.

9. Handrail: 1-1/4 inches (32 mm) diameter aluminum pipe.
   a. Form returns with 6 inch (152 mm) radius.
   b. Attach rail to stringer with pipe sections spaced at approximately 30 inches (610 mm) on center such that rail projects approximately 6 inches (152 mm) above stringer.
   c. Locate bottom of handrail 36 inches (915 mm) above finished floor.
   d. Extend rail above ladder such that top of rail is 36 inches (915 mm) above roof level

2.15 ROOF ACCESS LADDERS

1 Vertical steel ladders throughout, shall be constructed of 1 ½" x 3/8" steel flats for side bars, and ¾" diameter steel rods for rungs. Ladders shall be eighteen inches (18") wide, unless otherwise indicated, with rungs spaced at twelve inches (12") on center.

2. Rungs shall be shouldered and beaded to side bars of equivalent welded conections. Ladders shall have brackets to hold ladder a minimum of six and one-half inches (6 ½") away from the wall, and be spaced not over six feet (6') on centers. Where required, include steel cage construction to conform to the latest State Department Regulations for Ladders. All materials of exterior ladders shall be fabricated of galvanized steel.

2.16 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.18 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.19 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, nonmetallic grout unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.4 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete.

B. Fill annular space around bollard solidly with nonshrink, nonmetallic grout. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.5 INSTALLING BEARING AND LEVELING PLATES

1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

2. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5000

SECTION 05 5100 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.

B. Related Work

1. 055213 Handrails and Railings

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, registered in the Commonwealth of Pennsylvania, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed).

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

F. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

H. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

I. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

2.2 MISCELLANEOUS MATERIALS

A. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

B. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

C. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

D. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

E. Shop Primers: Provide primers that comply with Section 099123 "Painting."

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without impairing work.

E. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.4 STEEL-FRAMED STAIRS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alfab, Inc.
2. American Stair, Inc.
3. Sharon Companies Ltd.

B. Stair Framing:

1. Fabricate stringers of steel channels.
2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch (1.7 mm).

1. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.

2.5 STAIR RAILINGS

A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Refer to related section “05 5200 Handrails and Railings.”

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.

D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

E. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5100

SECTION 05 5213 - HANDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless-steel handrails, interior and exterior.

B. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this Section

1.2 SYSTEMS PERFORMANCES:

A. Structural Performances: Provide railing and handrail assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1. Handrails and Top rails: Capable of withstanding the following loads applied as l indicated:
   i. Concentrated Load of 200 lbf applied at any point in any direction.
   ii. Uniform load of 50 lbf per linear ft. applied simultaneously in both vertical and horizontal directions.
   iii. Concentrated and uniform loads above need to be assumed to act concurrently.
2. Infill of Guards:
   iv. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   v. Infill load and other loads need not be assumed to act concurrently, with uniform horizontal loads o top rails of railing assembly in determining stress on guard supporting members.

3. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 ACTION SUBMITTALS:

A. Product Data For the Following:
1. Manufacturer's product lines of mechanically connected railings.
2. Railing Brackets
3. Grout, anchoring cement, and paint products

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

E. Where materials of fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for Structural analysis.

1.4 INFORMATIONAL SUBMITTALS:

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE:

A. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL:

A. Brackets, Flanges, and Anchors cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 STAINLESS STEEL

A. Tubing: ASTM A 554 Grade MT304
B. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20

2.4 Not Used

2.5 FABRICATION:

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Fabricate handrails and railings to design, dimensions and details shown. Provide hand rail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to support the design loading indicated.

C. Form work true to line and level with accurate angles and surfaces.

D. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

F. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

G. Form changes in direction by bending or by inserting prefabricated elbow fittings.

H. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

K. Provide welded connections for handrails and railings

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.

M. Provide returns as indicated on the Drawings

N. Provide sizes as follows unless otherwise indicated on the drawings:
1. Guardrails: 2 ½” x ½” painted steel
2. Handrails: 1 ¼” diameter stainless steel
3. Bar Pickets: ½” x ½” painted steel
4. Posts: 2 ½” x ½” painted steel

2.6 FERROUS METAL FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Ferrous Metal Paint Finish:

C. Preparation: Clean surfaces of dirt, grease and loose rust or mill scale, including items fabricated from galvanized steel, if any, followed by a conversion coating of type suited to organic coating applied over it.

2.7 STAINLESS STEEL FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Stainless Steel Pipe and Tubing Finishes:

1. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
2. Polished and Buffed Finish: 320-grit finish followed by buffing [to a high luster finish.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorage's, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for adjustments during installation where taking field measurements before fabrication might delay work.

3.2 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Anchor posts in concrete by inserting into formed or core-drilled holes and grouting annular space.

D. Anchor posts to metal surfaces with oval flanges.

E. Anchor railing ends at walls with round flanges anchored to wall construction.

F. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

G. Attach railings to wall with wall brackets, except where end flanges are used. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt

H. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

4. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

I. Fit exposed connections accurately together to form tight, hairline joints.

J. Perform cutting, drilling, and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

K. Field Welding: Comply with applicable AWS Specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections, which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up paint coat.

L. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints.

M. Space posts at interval indicated, or if not indicated as required by design loadings.

N. Anchoring Posts: As detailed on Drawings.

O. Provide "inserts" prior to concrete placement. Set posts in grout after concrete curing.

P. Permanently connect railing components together using standard mechanical method and fittings, unless otherwise indicated. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railings.

3.3 ADJUST AND CLEAN

A. Protect finishes of railings and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Architect. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items, which cannot be refinished in the field, to the shop; make required alterations and refinish entire unit, or provide new units as required.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 05 5213

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rooftop equipment bases and support curbs.
   2. Wood framing, blocking, cants, and nailers.
   3. Wood furring.
   4. Wood sleepers.
   5. Plywood backing panels.

B. Related Requirements:
   1. Section 061600 "Sheathing."
   2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.
   3. Section 313116 "Termite Control" for site application of borate treatment to wood framing.

1.2 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   4. SPIB: The Southern Pine Inspection Bureau.
   5. WCLIB: West Coast Lumber Inspection Bureau.
   6. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an

agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent thickness or less, unless otherwise indicated.

C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load-bearing.
2. Species:

a. Hem-fir (north); NLGA.
b. Mixed southern pine; SPIB.
c. Spruce-pine-fir; NLGA.

B. Load-Bearing Partitions: No. 2 grade.

1. Application: Exterior walls and interior load-bearing partitions.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Douglas fir-larch (north); NLGA.

C. Ceiling Joists: Construction or No. 2.

1. Species:
a. Northern species; NLGA.

D. Joists, Rafters, and Other Framing Not Listed Above: No. 1 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Spruce-pine-fir; NLGA.

E. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Application: Exposed exterior and interior framing indicated to receive a stained or natural finish.
2. Species and Grade: As indicated above for load-bearing construction of same type.

2.4 ENGINEERED LUMBER FRAMING

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to

ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Boise Cascade Corporation.
    b. Finnforest USA.
    c. Georgia-Pacific.
    d. Jager Building Systems Inc.
    e. Louisiana-Pacific Corporation.
    f. Pacific Woodtech Corporation.
    g. Roseburg Forest Products Co.
    h. Standard Structures Inc.
    i. Stark Truss Company, Inc.
    j. West Fraser Timber Co., Ltd.

2. Extreme Fiber Stress in Bending, Edgewise: As indicated on drawings.
3. Modulus of Elasticity, Edgewise: As indicated on drawings.

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Louisiana-Pacific Corporation.
    b. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending, Edgewise: As indicated on drawings.
3. Modulus of Elasticity, Edgewise: As indicated on drawings.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber of any of the following species.

1. Northern species; NLGA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

F. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
1. Eastern softwoods; No. 3 Common grade; NeLMA.
2. Northern species; No. 3 Common grade; NLGA.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm)] nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. Simpson Strong-Tie Co., Inc.
3. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use for exterior locations and where indicated.

F. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.050 inch (1.3 mm).

G. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 1-1/2 inches (38 mm)
2. Thickness: 0.050 inch (1.3 mm).

H. Bridging: Rigid, V-section, nailless type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.

I. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.

J. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: [3/4 inch (19 mm).
2. Thickness: [0.050 inch (1.3 mm).
3. Length: As indicated.

K. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick.Tie fastens to side of rafter or truss, face of top plates, and side of stud below.

L. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

M. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

1. As indicated on drawings

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

H. Do not splice structural members between supports unless otherwise indicated.

I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- (38-mm actual-) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.

4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

K. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

L. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

M.

N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

P. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring at [24 inches (610 mm)] [600 mm] o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) [400 mm] o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide studs sizes and spacing as indicated on drawings.
2. For interior partitions and walls, provide provide studs sizes and spacing as indicated on drawings.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal (89-mm actual) depth for openings 48 inches (1200 mm) and less in width, 6-inch nominal (140-mm actual) depth for openings 48 to 72 inches (1200 to 1800 mm) in width, 8-inch nominal (184-mm actual) depth for openings 72 to 120 inches (1800 to 3000 mm) in width, and not less than 10-inch nominal (235-mm actual) depth for openings 10 to 12 feet (3 to 3.6 m) in width.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.

D. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.

F. Provide solid blocking between joists under jamb studs for openings.

G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

H. Provide bridging of type indicated below, at intervals of 96 inches (2438 mm) o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-

89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Size: 2-by-12-inch nominal- (38-by-286-mm actual-) size, minimum.
2. Material: Laminated-veneer lumber or solid lumber.
3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches (89 mm) of effective depth.
4. Spacing: At least three framing members for each 36-inch (914-mm) clear width of stair.

B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

3.8 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C.

3.9 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1000

SECTION 06 16 00 – SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof sheathing.
2. Floor sheathing.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

B. Research/Evaluation Reports: For the following:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1.

B. Oriented Strand Board: DOC PS 2.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction, Use Category UC3b for exterior construction.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings.

2.3 WALL SHEATHING

A. Plywood Wall Sheathing: Exposure 1, Structural I sheathing.

B. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exposure 1, Structural I sheathing.

B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Structural I, Underlayment single-floor panels.

B. Oriented-Stand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Attic Subflooring:

a. Glue and nail to wood framing.

b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch (3 mm) apart at edges and ends.

2. Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 06 1600

SECTION 06 20 00 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this Section.

1.2 SUMMARY

A. This Section includes, but is not limited to, the following:

1. Interior standing and running trim.
2. Harwood Veneer Panels
3. Stainless steel ornamental trim
4. Coat hooks

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 6 Section "Rough Carpentry" for nailers and blocking for installing interior woodwork.

2. Division 8 Section "Flush Wood Doors" for doors specified by reference to architectural woodwork.

3. Division 9 Section “Painting” for field finishing has installed interior architectural woodwork.

C. DEFINITIONS: Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Contract Documents.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop Drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of nailers and blocking, including concealed blocking specified in other sections.
3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
4. Fabrication /Installation drawings to include elevations, joint details, fastening methods, backing requirements, panel jointing system and other features.

D. Samples for initial selection of the following in the form of manufacturers color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminates.

E. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

F. Qualification data for firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

1.5 Fire-Test-Response Characteristics: Provide materials with the following fire-test-response characteristics as determined by testing identical products per ASTM test method indicated below by UL, Wamock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction. Identify fire-retardant-treated material with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by Government Agencies, imprint on surfaces of materials that will be concealed from view after installation.

1.6 Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion. In addition, the flame front shall not progress more than 10 1/2 feet beyond the centerline of the burner at any time during the test.

1. Flame Spread: 25
2. Smoke Developed: 450

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental

conditions meet requirements specified in “Project Conditions”.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until buildings enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.9 COORDINATION: Coordinate sizes and locations of nailers and blocking and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying the referenced quality standard and of the following grade:

1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

1. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radium indicated for the following:

2. Corners of cabinets and edges of solid-wood (lumber) members: 1/16 inch.

3. Complete fabrication, including assembly and hardware application, before shipment to project site to maximum extent possible. Disassemble

components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

4. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

5. Shop-cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water- resistant coating.

2.2 INTERIOR STANDING AND RUNNING TRIM

A. Quality standard: comply with AWI Section 300.

B. Grade: Premium.

C. Class: II or III.

D. Back out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

F. Wood Species: WD-1, Poplar

G. Finishes:
   1. Stain + Transparent coating. Stain color to be selected by architect.
   2. Opaque Paint coating. Color to be selected by architect.

4.3 HARDWOOD VENEER PANELS

A. Hardwood Veneer Panels: Hardwood veneer on MDF panels with 1/4” hardwood banding complying with HPVA HP-1, made without urea-formaldehyde adhesive.

   1. Face Veneer Species and Cut:

      a. WVP: Plain-sliced White Maple (Light color stain).

   2. Veneer Matching: Selected for similar color and grain.
   3. Thickness: 1/2” panel
   4. Finish: Manufacturer's standard, transparent, UV-resistant, protective finish as selected by Architect from manufacturer's full range.
   5. Wood Veneer Panels shall be Fire Retardant-Treated Panel Material as follows:

a. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 75 (Class B) or less when tested according to ASTM E 84.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.

b. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber and plywood indicated to receive a stained or natural finish, mark back of each piece.

2.4 PREPARATION

A. Condition all panels and woodwork to average prevailing humidity conditions in installation areas
before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required.

C. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.

2.5 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to nailers and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available). Do not use pieces less than 36 inches (900 mm) long. Stagger joints in adjacent and related members. Fill gaps, if any, with plastic wood filler, sand smooth, and finish same as wood.

F. Install no more than 1/8 inch in 96-inch (3 mm in 2400) variation form a straight line.

G. Install slotted wood panels using adhesives and screws in accordance with the manufacturer's fabricators instructions.

H. Use bead of adhesive full width of panel at each stud

I. Locate panel ends over studs and screw panels to every other stud not more than 12 inches on center vertically; install screws in groves. Flathead, 1 1/2" inches long, minimum. If panels need to be shortened, cut from bottom of lowest panel on wall.

2.6 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replaces woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged or soiled areas.

2.7 PROTECTION:

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer that ensure that woodwork is without damage or deterioration at the time of Substantial Completion.

2.8 ACCESSORY

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

1. Coat Hooks, "Hang Safe Hooks" – Brushed nickel-plated brass.
2. Metal Edging – Stainless steel with #4 satin finish

END OF SECTION 06 20 00

SECTION 06 41 16 – PLASTIC LAMINATE FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product , including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.
2. Thermoset decorative panels, for each color, pattern, and surface finish.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program

B. Installer Qualifications: Fabricator of products & Certified participant in AWI's Quality Certification Program

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Grade: Premium

C. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure"according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

D. Type of Construction: Frameless Flush Overlay

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. Reveal Dimension: 1/2 inch (13 mm)

G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Abet Laminati, Inc.
b. Formica Corporation.
c. Nevarmar Co. LLC.
d. Wilsonart International; Div. of Premark International, Inc.

H. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGL.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.

I. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: [High-pressure decorative laminate, NEMA LD 3, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

K.

1. As selected by Architect and noted on the drawings:
   a. Solid colors with core same color as surface, matte finish.
   b. Wood grains, matte finish.
   c. Patterns, matte finish.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
2. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. Medium-Density Fiberboard: ANSI A208.2, Grade 130 , made with binder containing no urea formaldehyde.
4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter]

E. Catches: Magnetic catches, BHMA A156.9, B03141

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.

G. Drawer Slides: BHMA A156.9.
   1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
   2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
   3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
   4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
   5. For computer keyboard shelves, provide Grade 1HD-100.
   6. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200].

H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
   2. Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

C. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing screws for exposed fastening, countersunk and filled flush with woodwork.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

END OF SECTION 06 41 16

SECTION 07 1326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Modified bituminous sheet waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Retain "Shop Drawings" Paragraph below if justified by extent or complexity of waterproofing.

C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

D. Retain subparagraph below if using pedestal-supported concrete pavers on plaza decks over waterproofing.

E. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Trade names used herein for membrane waterproofing are those of W.R. Grace. Other acceptable manufacturers include Sika, Greenstreak, Carlisle Coatings and Waterproofing, Henry Co. and Polyguard provided manufacturers noted substitute their equivalent products.

B. For foundation walls, provide "Bituthene 4000" sheet waterproofing membrane, 60 mils thick, and "Bituthene Liquid Membrane," 60 mils thick, for flashing, as manufactured by W. R. Grace or approved equal noted above.

C. HDPE membrane shall have a protective layer to protect the membrane from the weather and U.V. for up to 30 days before casting concrete against it.

D. Primer/Conditioner: "Bituthene 4000" latex/water based primer specifically formulated to provide adhesion of Bituthene Waterproofing Membranes.
   1. If water-based primer does not provide sufficient adhesion to substrate, substitute Bituthane Primer B-2 solvent-based primer.

E. Bituthene Elastomeric Mastic: Rubberized asphalt base mastic.

F. Tape: Double sided synthetic adhesive tape equal to "Preprufe LT" and "HC."

G. Protection Board: 1/4" thick semi-rigid protection board, "Bituthene Asphaltic Hardboard."

H. Bituthene Liquid Membrane: Two-component 100% solids trowel grade asphalt modified urethane.

I. "Hydroduct 220" Drainage Board/Composite: Prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side by W.R. Grace.
   1. At horizontal applications, use "Hydroduct 660" by W.R. Grace.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

3.2 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Immediately install protection course with butted joints over waterproofing membrane.

1. Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.3 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.

3.4 INSULATION DRAINAGE-PANEL INSTALLATION

A. Install insulation drainage panels over waterproofed surfaces. Cut and fit to within 1/4 inch (19 mm) of projections and penetrations.

B. Ensure that drainage channels are aligned and free of obstructions.

C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.

D. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.5 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 1326

SECTION 07 1700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bentonite waterproofing for Elevator Pit (blind side location)

B. Related Sections:

1. Div 03: Cast-In-Place Concrete
2. Div 04: Unit Masonry

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for interface with other work.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Product test reports.

C. Sample warranty.

1.4 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree(s) to repair or replace components of bentonite waterproofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GEOTEXTILE/BENTONITE SHEETS

A. Geotextile/Bentonite Waterproofing: Minimum of 1.0 lb/sq. ft. (5 kg/sq. m) of bentonite clay granules between two layers of geotextile polypropylene fabric, one woven and one nonwoven, needle punched and heat fused together.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing; CCW MiraCLAY.
b. CETCO; Voltex.

2. Grab Tensile Strength: 95 lbf (422 N) according to ASTM D 4632.

2.2 INSTALLATION ACCESSORIES

A. General: Manufacturer's standard accessories recommended for intended use and compatible with bentonite waterproofing.

B. Geotextile Protection Course: As recommended by waterproofing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Prepare substrates to be waterproofed, install waterproofing and accessories, and protect waterproofing from damage and wetting according to manufacturer's written instructions.

B. Install protection course before backfilling or placing overburden when recommended by waterproofing manufacturer.

3.2 GEOTEXTILE/BENTONITE SHEET INSTALLATION

A. Install a continuous layer of waterproofing sheets directly against concrete to be waterproofed. Lap ends and edges a minimum of 4 inches (100 mm) on horizontal and vertical substrates. Stagger end joints between sheets a minimum of 24 inches (600 mm). Fasten seams by stapling to adjacent sheet or nailing to substrate.

3.3 BENTONITE PANEL INSTALLATION

A. Install a continuous layer of bentonite waterproofing panels with ends and edges lapped a minimum of 4 inches (100 mm) unless otherwise indicated. Stagger joints in adjoining panel rows.

B. Install waterproofing sheet in strict accordance with the manufacturer's installation guidelines. Use accessory products as recommended. Install waterproofing sheet with the (woven) geotextile toward the concrete to be waterproofed. Install Waterstop accessory in all applicable horizontal and vertical concrete construction joints as follows:

1. Expanding bentonite-based concrete joint strip waterstop, manufactured in flexible strips, for use in non-moving concrete construction joints
2. Locations:
    a. Base of Foundation Stem wall to spread footing
    b. Perimeter of floor slab on grade to spread footing

3.4 INSULATION INSTALLATION

A. On vertical surfaces, set insulation units pinned in place with tape applied according to manufacturer's written instructions.

B. On horizontal surfaces, loosely lay insulation units. Stagger end joints and tightly abut insulation units.

END OF SECTION 07 17 00

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SECTION 07 2100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Perimeter wall insulation (supporting backfill).
3. Concealed cavity building insulation.
4. Safing Insulation.
5. Sound attenuation insulation.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration because of high humidity, after

inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

C. Research/Evaluation Reports: For foam-plastic insulation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Perimeter Insulation: Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, Provide thickness as indicated on the Drawings.

1. Manufacturers:

a. Amoco Foam Products Company, Smyrna, GA. - "Amofoam;"
b. DiversiFoam Products;
c. Dow Chemical Company - "Styrofoam Square Edge";
d. Owens Corning – “Foamular.”

2. Density: 1 pcf;
3. Minimum compressive strength: 25 psi when tested in accordance with ASTM D 1621;
4. Aged R-value: 5.0 per inch at 75 degree mean temperature in accordance with ASTM C 518;

2.3 CONCEALED CAVITY WALL INSULATION

A. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using hydrochlorofluorocarbons as blowing agent and faced on both sides with aluminum foil to comply with referenced standards and with other requirements indicated below:
1. Federal Standard: FS HH-I-1972/1, Class 1 (nonreinforced core) or 2 (reinforced core).
2. ASTM Standard: ASTM C 1289, Type I, Class 1 or 2.
3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches.
4. Thermal Resistivity: 7.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.4 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.

3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, vapor-retarder membrane on 1 face.

C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
1. 2-1/2 inches thick: R-10.9 (Owens Corning CW225);
2. 3-1/2 inches thick: R-13;
3. 6-1/4 inches thick: R-19;
4. 8-1/4 inches thick: R-30;
5. Other thicknesses as indicated or required.

2.5 SAFING INSULATION

A. Manufacturers:
1. Fibrex Insulations, Westmont, IL - "FBX Safing Insulation;"
2. Thermafiber LLC, division of United States Gypsum Company, Wabash, IN - "Thermafiber."

B. Asbestos-free, semi-refracting fibers in thicknesses and widths as required with the following attributes:
1. Melting Point: Up to 2,000 degrees F;
2. Non-combustible in accordance with ASTM E 136;
3. Density: 4.0 pcf minimum;
4. Flame Spread/Smoke Density: 5/0 in accordance with ASTM E 84;
5. Moisture Absorption: Less than 1.0 percent per ASTM C 553;

2.6 SOUND ATTENUATION BATT INSULATION

A. Manufacturers:

1. USG Interiors Division, Chicago, IL - "Thermafiber SAFB."
2. Or alternative of the quality necessary to meet the specifications.

B. Semi-rigid, 2.5 pcf density, mineral-fiber blanket, 3 inches thick, other thicknesses as indicated on the Drawings, unfaced.

2.7 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.8 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERMANENT INSULATING CONCRETE FORMS

A. On horizontal surfaces, insulation units may be dry-laid on conc floor slab or set in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. Install Insulating Concrete Forms according to manufacturer’s recommendations

2. All slabs must be clean in areas where forms are to be installed.

3. Ensure that all formwork is level, square and straight and tight fitting to surrounding walls.

4. Install insulation board with joints tightly butted and offset a minimum of 12” from the layer below.

5. Top layer is to be set in adhesive

3.5 INSTALLATION OF PERIMETER INSULATION

A. On vertical surfaces, insulation units may be dry-laid against foundation as backfilling progresses or set in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. Install insulation board with joints tightly butted.

3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Place insulation behind electrical receptacles and piping, with vapor barrier facing to the warm-in-winter side, to form a completely insulated area. Install with tight joints. Cut neatly at all intersections and penetrations.
4. Seal joints on inside face of insulation units with vapor barrier type facing, with self-adhesive vapor barrier tape, and tape over punctures and seal at edges of coverage and at penetrating elements, so as to form a complete vapor barrier for expanse of insulation in each area;
5. Seal joints caused by pipes, conduits, electrical boxes and similar item penetrating vapor retarders with cloth or aluminized tape of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder;
6. Repair any tears or punctures in vapor barrier immediately before concealment by other work. Cover with tape or another layer of vapor retarder.
7. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
8. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.7 SAFING INSULATION

A. Install at joints between fire rated walls and underside of overhead structure and other locations where indicated so that an effective fire stop is provided.

3.8 SOUND ATTENUATION INSULATION

A. Install sound control batt insulation in stud cavities extending up to underside of floor or roof deck above. Friction-fit between metal studs, behind electrical receptacles and piping. Install with tight joints. Cut neatly at all joints and intersections and as required for stud spacings.

3.9 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2100

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SECTION 07 2726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fluid-applied, vapor-retarding membrane air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, W.R. Meadow's Air-Shield LSR or a comparable product by one of the following manufacturers:
   a. Carlisle Coatings & Waterproofing Inc.
   b. Henry Company.
   c. Tremco Incorporated.

2. Physical and Performance Properties:

   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M.
   c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Modified Bituminous Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.

J. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

K. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

L. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms.

M. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

N. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
4. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements.

C. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.
14. <Insert value> of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than number of days recommended by manufacturer, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 2726

SECTION 07 5323 - EPDM SINGLE-PLY MEMBRANE ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Adhered sheet roofing.
2. Roof insulation.

B. Related Sections include the following:
1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 07 Section "Joint Sealants."

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

a. Fire/Windstorm Classification: Class 1-90.

D. Roofing System Design: Provide a roofing system that complies with roofing system manufacturer's written design instructions and with the following:

1. SPRI's "Wind Design Guide for Adhered Roofing Systems."

    a. Exposure Category: As derived from the referenced SPRI guide or ASCE 7.
    b. System Design: Derive from design tables in the referenced SPRI guide or ANSI/RMA/SPRI RP-4, based on building height, parapet height, wind speed, and exposure category.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of roof insulation.
3. 12-inch length of metal termination bars.
4. 2 insulation fasteners of each type, length, and finish.

A. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

E. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

F. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and slopes indicated.

C. Preinstallation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Construction Site Manager, Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer’s name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Roofing Manufacturer's Extended System Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EPDM: ASTM D 4637, Type 1, class B or better, nonreinforced uniform, 60 mil, black, flexible EPDM sheet.
   a. Basis of Design Product: Subject to compliance with requirements, provide Carlisle SynTec Incorporated.
   b. Acceptable equals: Firestone, Johns Manville, or pre-approved equal.

2. Polyisocyanurate Board Insulation:
    a. Complys with ASTM-C1289
    b. Rigid closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
    c. Compressive strength: 20 psi
    d. Thickness: As indicated on Drawings.
    e. Joints: Staggerred.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 90-mil- thick EPDM, partially uncured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Splice Adhesive and Cleaner: Single-component butyl splicing adhesive and solvent-based splice cleaner.

E. Splice Primer and Tape: Manufacturer's standard synthetic rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

F. Lap Sealant: Manufacturer's standard single-component sealant.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch wide, roll formed and prepunched.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

J. Vapor Retarder shall be reinfored polyethlene film conforming to ASTM D 4397, 6 minl thick, minimum, with maximum permeance ratting of 0.1 perm. Seam Tape: Prissure-sensitive tape of yope recommended by vapor retarder.

2.4 INSULATION MATERIALS

A. General: Provide preformed roof insulation boards that comply with requirements, selected from manufacturer’s standard sizes and of thicknesses indicated.

1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:

a. ¼" inch per 12 inches (1:48), unless otherwise indicated.
b. Minimum thickness on tapered and flat areas to be 1 ½" thick at the roof drain location.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents to comply with ASTM C 1289, classified by facer type as follows:

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.6 WALKWAYS

A. Protective surfacing for roof traffic shall be Sure-White (white) Pressure-Sensitive Walkway Pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with Sure-Seal Primer.
   a. Provide where shown on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.

D. Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections. At reroof areas, remove existing aggregate and asphalt flood coat as necessary to prepare surface for installation of cover board.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation and pre-formed shapes under area of roofing to conform to slopes indicated and to Shop Drawings.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Install required thickness in layers not to exceed 3” with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Attached Insulation (Mechanical): Secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type indicated. Install subsequent layers of insulation per Drawings.

1. Fasten insulation according to the insulation and roofing system manufacturers' written instructions.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing system manufacturer's written instructions. All cover boards to be fastened with top surface fasteners.

3.4 ADHERED SHEET INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to 'relax' for a minimum of 30 minutes.
   1. Install EPDM membrane according to roofing system manufacturers' written instructions.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of sheet.

D. Mechanically or adhesively fasten sheet securely at terminations and perimeter of roofing.

E. Apply roofing sheet with side laps shingled with slope of roof deck where possible.

F. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.

3.5 SEAM INSTALLATION

A. Clean and prime both faces of splice areas, apply splice tape, then install 6" seam tape and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation.

B. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.6 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Construction Manager or Owner 48 hours in advance of the date and time of inspection.

3.8 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Construction Manager and Owner.

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.9 ROOFING INSTALLER'S WARRANTY (submit completed form)

A. WHEREAS <*Name*> _____ of <*Address*> _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work:
6. Acceptance Date:
7. Warranty Period:
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed 55 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 07 5323

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SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Exposed trim, gravel stops, parapet caps
2. Metal flashing
3. Reglets

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 04 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
2. Division 07 Section "Expansion Joint Cover Assemblies" for metal expansion-joint covers.
3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
4. Division 07 Section "Roof Expansion Assemblies" for Elastic-sheet-covered foam, bellows-type roof expansion assemblies
5. Division 07 Section "Joint Sealants" for elastomeric sealants.
6. Division 07 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 2: Wind pressures of 31 to 45 psf.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.
2. 12-inch- long Samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Factory-Painted Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.

B. Galvanized Steel Sheet (for work not exposed to view): ASTM A 526, G 90, commercial quality, or ASTM A 527, G 90, lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch thick, unless otherwise indicated.

C. Aluminum-Zinc Alloy-Coated Steel Sheet (for work not exposed to view): ASTM A 792, Class AZ-50 coating, Grade 40 or to suit project conditions, with 55 percent aluminum, not less than 0.0396 inch thick, unless otherwise indicated.

D. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch thick, unless otherwise indicated.

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

D. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

E. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

F. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: Aluminum, 0.024 inch thick.
2. Material: Galvanized steel, 0.0217 inch thick.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Fry Reglet Corporation.
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

F. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

H. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

I. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Exposed Trim, Gravel Stops, and Fasciae and parapet caps: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.
2. Coil-Coated Galvanized Steel: 0.0276 inch thick.

C. Base Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

D. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.
2. Galvanized Steel: 0.0217 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.0217 inch thick.

E. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.
2. Galvanized Steel: 0.0217 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.0217 inch thick.
4. Coil-Coated Galvanized Steel: 0.0217 inch thick.

F. Drip Edges: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

G. Eave Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

H. Equipment Support Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.
3. Coil-Coated Galvanized Steel: 0.0276 inch thick.

I. Overhead-Piping Safety Pans: Fabricate from the following material:

1. Galvanized Steel: 0.0396 inch thick.

2.6 ALUMINUM EXTRUSION FABRICATIONS

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.7 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. Class I, Clear Anodic Finish: AA-C2241 (Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

2.8 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

    a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.
    b. Resin Manufacturers: Subject to compliance with requirements, provide fluoropolymer coating systems containing resins produced by one of the following manufacturers:

        1) Ausimont USA, Inc. (Hylar 5000)
        2) Elf Atochem North America, Inc. (Kynar 500)

2. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

   a. Cheney Flashing Company
   b. Copper Sales, Inc.
   c. MM Systems Corporation.
   d. Petersen Aluminum Corporation.
   e. Vincent Metals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except where pre-tinned surface would show in finished Work.

   1. Do not solder the following metals:

a. Aluminum.
b. Coil-coated galvanized steel sheet.

2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

I. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

J. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

K. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

L. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 6200

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SECTION 07 7000 - ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof specialties and accessories of the following types:
   1. Cornices.
   2. Gravel stops

1.2 RELATED SECTIONS

A. Div 06 - Rough Carpentry.

B. Div 07 - Sheet Metal Roofing.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit manufacturer's detailed product data showing dimensions of individual components, profiles, and finishes, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Fully dimensioned roof plans, reflective plan views, dimensioned framing requirements, sections and details of components and other related trims.

D. Selection Samples: For each finish product specified, manufacturer's technical data for specified finish and color chart showing full range of colors available.

E. Verification Samples: For each finish product specified, manufacturer's technical data for specified finish and two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

A. Obtain all components and related accessories from one single source manufacturer.

B. Where pre-engineered manufactured products are specified, other field fabricated or shop/field fabricated substitutions will not be accepted. However, where shop/field fabrications are indicated pre-engineered systems will be considered with Architect approval.

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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. All products delivered shall be stored in a clean dry location prior to installation.

C. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.

D. Inspect material before installation. Do not install finished materials with scars or abrasions.

E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Coordinate work of this Section with adjoining work for proper sequencing to ensure protection from inclimate weather and to protect materials and their finish against damage.

B. Do not install cornice and decorative trims during inclimate weather. When installing in cold climates warm sealant to at least 50 degrees F (10 degrees C) prior to application.

1.7 WARRANTY

A. Wind and Finish Warranty:

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: SAF or approved equal meeting the performance specifications.

B. Requests for substitutions will be considered in accordance with provisions of Division 01.

2.2 CORNICES

A. Provide cornice system with decorative trims as manufactured by Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc.

1. Product: Cornice Design 8EX as shown on the drawings.
   a. Nominal Size - 24inches minimum Entablature by 8 inches depth nominal.

B. Material: Decorative cornice profiles shall be manufactured from 0.040 inch (1.0

mm) aluminum, 10 feet (3048 mm) lengths.

C. Fabrication:
   1. Profiles containing radius bends shall be press formed with radius dies on a CNC Press to provide repeated true and accurate profiles.
   2. Cornice trims shall be factory punched with elongated fastening holes.
   3. Decorative cornice splices shall be manufactured from 0.040 inch (1.0 mm) aluminum, 6 inches (152 mm) lengths, formed to fit the inside of the cornice profiles.
   4. Support brackets, attachments brackets and retainer brackets shall be manufactured from 0.125 inch (3 mm) by 1.0 inch (25 mm) extruded aluminum bar, helliarc welded construction (where necessary), factory punched for fasteners.
   5. Provide factory mitered corners, precision saw cut, helliarc tack welded to produce a picture frame joint.

D. Trim:
   1. Mitered Corners: Provide factory mitered corners for all cornice profiles (excluding soffits). Cornice profiles shall be precision saw cut, helliarc tack welded to produce a picture frame joint.
   2. Sculptured End Caps: Provide factory mitered end caps for cornice. Cornice profiles shall be precision saw cut, heliarc tack welded to produce a picture frame joint.
   3. Cornice Returns: If shown on drawings, provide cornice returns at eaves and rake terminations in lengths as indicated on plans.
   4. Rake and Gable Trims: As shown on drawings, provide rake and gable trims in profiles as indicated complete with concealed splices, attachment brackets (if required).

E. Finish:
   1. Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces.
   2. Pretreatment: Aluminum components shall be pretreated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion coating to which organic coatings will firmly adhere.
   3. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Atochem, Inc. Kynar 500 or Ausimont U.S.A., Inc. Hylar 5000 resin, meeting AAMA 2605 specification.
   4. Color: As selected by Architect from manufacturer's offered colors.

F. Finish:
   1. Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces.
   2. Pretreatment: Aluminum components shall be pretreated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion coating to which organic coatings will

firmly adhere.

3. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Atochem, Inc. Kynar 500 or Ausimont U.S.A., Inc. Hylar 5000 resin, meeting AAMA 2605 specification.
4. Color: As selected by Architect from manufacturer's offered colors.

2.3 ARCHITECTURAL GRAVEL STOPS

A. Provide gravel stops as manufactured by Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc.

B. Product: Press-Loc.
   1. Custom size: Refer to drawings.
   2. Pre-engineered Size: 4.5 inches
   3. Fabrication:
      a. Fascia up to 12 inches (305 mm), over 12 inches (305 mm) provide extenders.
      b. Gravel dam up to 3 inches
      c. 4 inches (102 mm) roof leg factory punched for fasteners.
      d. Continuous cleat required.
      e. 3/4 inch (19 mm) hemmed drip edge for stiffness and to engage cleats.
      f. Brick Ledge: Width as indicated or required.
      g. Extender: Length as indicated or required. Material and finish to match gravel stop.

C. Product: Flow-Thru.
   1. Perforated face; hole pattern is 3/16 inch (5 mm) holes at 1/4 inch (6 mm) staggered centers allowing a 50 percent open area. Face is factory notched on one end for a 4 inches (102 mm) lap joint.
   2. Roof leg is factory punched for fasteners.
      a. Brick Ledge: Width as indicated or required.
      b. Extender: Length as indicated or required. Material and finish to match gravel stop.

D. Material/Finish:
   1. Material: 0.063 inch (1.6 mm) Aluminum.
   2. Finish: Custom Kynar.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for project conditions.

C. The installer shall examine substrates and conditions under which cornice and decorative profiles will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

D. The installer shall field verify that framing has been built in accordance with the dimensions furnished by the cornice manufacturer either by shop drawings or published literature. Do not proceed with installation until unsatisfactory conditions are corrected.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions and approved submittals.

3.4 CORNICE AND GRAVEL STOP INSTALLATION

A. Follow manufacturer's guidelines and shop drawings for installing pre-designed cornice and decorative trims. If cornice or trims join a roof system then follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing decorative trims to roof.

B. The pre-designed cornice and decorative trims shall be installed in strict accordance with manufacturer's printed instructions and shop drawings.

C. Fastening: Cornice trims shall be nailed through elongated holes with 1-1/2 inches (38 mm) stainless steel nails. Support brackets, retaining brackets and attachment brackets shall be installed with #10 by 2 inches (52 mm) stainless steel wood screws at locations and spacing as shown on shop drawings.

D. Install cornice profiles and decorative trims with concealed splice plates over brackets and/or framing substrates as shown on shop drawings. In accordance with shop drawings;
   1. Coordinate and align spacing of expansion reveal joints with associated trims (stack joints).
   2. Plan spacing of joints so there is no sections of fascia shorter than 48 inches (1219 mm) in length.
   3. Check horizontal alignment of fascia during installation and adjust as required.

3.5 GUTTER INSTALLATION

A. Support Brackets: Layout support brackets to provide 1/2 inch (13 mm) slope in 40 linear feet (12 m). Install support brackets with #10 by 2 inches (52 mm) stainless steel wood screws.

B. Liner: Install concealed gutter liner onto support brackets and fasten to substrates with 1-1/2 inches (38 mm) aluminum or stainless steel nails. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.

C. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40 feet (12 m) centers.

D. Locate and install downspouts before proceeding with fascia installation.

E. Install interior straps by fully engaging them into liner and fascia, complete by securely riveting.

F. Install fascia with concealed splice plates over support brackets and liner. Coordinate and align spacing of joints with associated trims if applicable. Plan spacing of joints so there are no sections of fascia shorter than 48 inches (1219 mm) in length. Check horizontal alignment of fascia during installation and adjust as required. At downspout locations, neatly cut fascia to accommodate downspout.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 7200 – ROOF ACCESSORIES

PART 1 - GENERAL

1.1 STIPULATIONS

A. The Drawings and General Provisions of the contract, including General Conditions, Special Requirements, and Division I Specification Sections, form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. This Section includes the following:

1. Roof Drains
2. Roof Overflow Scupper Drains
3. Roof Hatch

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for ladders and miscellaneous metal framing and supports.
2. Division 6 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
3. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, scuppers, gutters and downspouts, fasciae, roof expansion-joint covers, valleys, and miscellaneous sheet metal trim and accessories.
4. Division 7 Section "Roof Expansion Assemblies" for roof expansion-joint covers.
5. Division 7 Sections for roofing accessories included as part of roofing Work.
6. Division 9 Section "Painting" for shop primers and field painting.
7. Division 23 Section "Power Ventilators" for power roof-mounted ventilators.
8. Division 22 Section "Plumbing" for rain water piping

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.

3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for roof accessories with factory-applied color finishes.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M) for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.

B. Extruded Aluminum: ASTM B 221 (ASTM B 221M) alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.

C. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 (Z275) coating designation; commercial quality, unless otherwise indicated.

1. Structural Quality: Grade 40 (Grade 275), where indicated or as required for strength.

D. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M with Class AZ-50 (AZ-150) coating, structural quality, Grade 40 (Grade 275), or as required for strength.

E. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

F. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

G. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

I. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coating.

J. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

K. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

L. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.2 ROOF DRAINS

A. Furnish and install roof drains, gutter drains and thruwall scuppers complying with NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated.

1. Roof Drain Basis of Design: JR Smith roof drain model # 1015Y-R-C-CID or approved equal. Provide roof drain assembly complete with drain receiver pan, under deck clamps, cast iron Dome, stainless steel Gravel guard and extension collars.

2. Roof Gutter Drain Basis of Design: JR Smith roof 'Gutter' drain model # 1600 series 'Low Dome" 2" outlet or approved equal. Provide roof drain assembly complete with galvanize pipe extending 1" below metal soffit panel.

3. Roof Overflow Scupper Drain Basis of Design: JR Smith roof scupper drain model No 1580 galv steel body, 3" da outlet or approved equal. With "Lambs tongue" down spout nozzle JR Smith model No. 1770-CAN NB (Nickel Bronze), 3" dia outlet. Provide complete assembly with threaded galv steel thruwall pipe extension.

2.3 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

2.5 GALVANIZED STEEL SHEET FINISHES

A. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.

1. Shop Primer: Exterior galvanized metal primer per Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated.

C. Install roof drains and gutter according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated. General contractor is to furnish and install roof drains and gutter drains.

1. General contractor shall install Roof drains ready for rainwater conductors (piping) connection by Plumbing Contractor.

2. General contractor shall install roof gutter drains located at roof overhangs with 2” dia threaded galvanized pipe extention 1” below the finished metal soffit panel. Install pipe clamps to provide rigid installation. Coat cut pipe surfaces with 3 coats cold galvanizing coating.

3. General contractor shall install roof overflow scupper drains with pipe extension and “lambs tongue” downspout nozzle at overflow scupper locations shown on the drawings. Set the elevation of the supper drain 2” min / 4” max above adjacent roof drain elevation.

D. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

E. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

F. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.

G. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 07 72 00

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SECTION 07 8413 – THROUGH-PENETRATION FIRESTOPPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:

1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

    a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Classification markings on penetration firestopping correspond to designations listed by the following:

        1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following:
   1. Hilti, Inc.
   2. 3M Fire Protection Products.
   3. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those

components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-wool-fiber or rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods

used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 8413

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SECTION 07 8446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

B. Related Sections:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hilti, Inc.
   b. Johns Manville.
   c. 3M Fire Protection Products.
   d. Tremco, Inc.; Tremco Fire Protection Systems Group.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07 8446

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SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The following locations shall receive sealant in addition to locations shown on the Drawings:
   1. Where required to provide a positive barrier against passage of air and passage of moisture;
   2. Exterior and interior perimeter of all openings in exterior walls such as doors, windows, frames, louvers, grilles, etc.
   3. Joints where metal frames meet masonry;
   4. Control and expansion joints in masonry walls;
   5. Joints where masonry meets exposed structural or concrete steel members;
   6. Joints in cast stone, limestone, precast concrete and wall caps;
   7. Exterior door thresholds;
   8. Expansion joints in exterior concrete sidewalks, slabs, steps, and curbs;
   9. Joints in metal panels, siding or pre-formed roofing, to the extent required by the manufacturer's instructions;
   10. Joints at all locations where different materials are adjacent to each other;
   11. Joints of material that are uneven, irregular, or out-of-plane;
   12. Interior slabs on grade: All expansion, isolation, construction, and control joints, plumbing and electrical penetrations, steel column penetrations, and any other items penetrating slab on grade to provide a positive barrier against the passage of radon gas.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view. Provide custom colors where directed by Architect.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under service and application conditions, as demonstrated by testing and field experience.

D. This contractor shall, prior to sealing of interior slabs on grade, familiarize himself with radon, radon entry routes, and proper workmanship requirements to prevent the migration of radon gas into interior spaces. This Contractor shall exercise the highest quality control standards so as not to reduce the effectiveness of the proposed radon mitigation system.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in manufacturer's original sealed containers with labels attached showing expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store in a dry space below 80 degrees Fahrenheit.

C. Handle material according to manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is de-ionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.2 SEALANTS

A. Two-Part Urethane Sealant: For locations except where another type is specified, sealant material shall conform to FS-TT-S-00227E, Type II, Class A and B ASTM C 920, Type M, Grade NS, Class 25. Provide one of the following:
1. "Sonolastic NP-2" by Sonneborn Building Products,
2. "Dynatrol II" by Pecora Corporation,
3. "Chem-Calk 500" by Bostik Construction Products,
4. "Dymeric 240" by Tremco,
5. "Vulkem 922" by Tremco.

B. One Part, Low Modulus, Silicone: For joints in cast stone, limestone, precast concrete, metal constructions, and column covers. ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT. Provide one of the following:
1. "864" by Pecora Corporation,
2. "Spectrum 1" by Tremco with Primer #23,
3. or equal as approved by the Architect.

C. One Part, Pourable Urethane Sealant: For expansion and control joints in exposed slabs on grade, ASTM C 920, Type S, Grade P, Class 25, for Use T. Provide one of the following:
1. "Urexpan NR-201" by Pecora Corp.,

2. "Sonolastic SL-1" by Sonneborn Building Products Co.,
3. "Vulkem 45" by Tremco.

D. Acrylic-Emulsion Sealant: For interior paintable joints in walls, manufacturer's standard, one-part, nonsag, acrylic, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, Type OP, Grade NF. Provide one of the following:
1. "Sonolac" by Sonneborn Building Products Co.,
2. "AC-20+ Silicone" by Pecora Corp.,
3. "Chem-Calk 600" by Bostik Corp.,
4. "Acrylic Latex 834"by Tremco.

E. Fire-Stop Sealant: Refer to Division 07 Section “Fire-Resistive Joint Systems”.

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Elastomeric Tubing Joint-Fillers: Butyl or EPDM tubing complying with ASTM D 1056, Non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance. Elastomeric tubing materials shall be of type or types recommended by sealant manufacturer.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Accessory Materials for Fire-Stopping Sealant: Forming joint-fillers, packing and other accessory materials as required for installation of fire-stopping sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

1. Elastomeric Sealant Installation Standard: Comply with ASTM C 962;
2. Latex Sealant Installation Standard: Comply with ASTM C 790;
3. Provide firestopping for conditions specified whether or not firestopping is indicated.

B. Sealing of all cracks in interior slabs on grade shall be included in the work of this Section.

C. Apply sealant with a gun, with proper size nozzles. Cracks smaller than 1/8 inch shall be sealed using a putty knife or other appropriate tool to sufficiently seal the crack. Use sufficient pressure to fill all voids and joints solid to the backup material.

D. Surface of sealant shall be a full smooth bead, free of ridges, wrinkles, sags, air pockets and imbedded impurities.

E. After all joints have been completely filled they shall be neatly tooled to eliminate air pockets or voids, and to provide a smooth, neat appearing finish.

F. Immediately clean adjacent materials, which have been soiled; leave work in a neat, clean condition.

G. Where urethane and silicone sealants abut, comply with manufacturer's recommended installation procedures so as to prevent adverse reactions

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 9200

SECTION 08 0671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

D. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 71 00 – Door Hardware.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. RF - Rixson
6. NO - Norton
7. OT - Other
8. SU - Securitron
9. LU - Lund Equipment Co

Hardware Sets

Set: 1.0

Doors: 107.1, 108.3, 111.1

1 Continuous Hinge	CFM-SLF-HD1		PE
1 Rim Exit Device, Storeroom	DG160 16 43 8804 Less Pull	US32D	SA
2 Core	DG1 6300 GMK	US15	SA
1 Door Pull	RM3311-12 Mtg-Type 12XHD	US32D	RO
1 Conc Overhead Stop	6-X36	630	RF
1 Surface Closer	J7500 x mounting plate to suit application	689	NO

1 Threshold	252x3AFG Pemkote MSES25SS		PE
1 Weatherstrip	- integral within construction of door and frame assembly		OT
1 Sweep	29326CNB TKSP		PE

Set: 2.0

Doors: 007.1

1 Continuous Hinge	CFM-HD1		PE
1 Rim Exit Device, Storeroom	DG160 16 43 8804 Less Pull	US32D	SA
2 Core	DG1 6300 GMK	US15	SA
1 Vandal Resistant Trim	VRT22 C	US32D	RO
1 Surface Closer	UNI7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Threshold	252x3AFG Pemkote MSES25SS		PE
1 Gasketing	2891APK TKSP8		PE
1 Rain Guard	346C TKSP8		PE
1 Door Bottom	216AFG TKSP		PE

Set: 3.0

Doors: 003.1, 205.1

6 Hinge (heavy weight)	T4A3786	US26D	MK
2 Surface Vert Rod Exit, Exit Only	43 NB8710 EO	US32D	SA
2 Surface Closer	PR7500	689	NO
4 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Wall Stop	406 / 409	US32D	RO
2 Silencer	608 / 609		RO

Set: 4.0

Doors: 311.2

6 Hinge (heavy weight)	T4A3786	US26D	MK
2 Surface Vert Rod Exit, Exit Only	43 NB8710 EO	US32D	SA
2 Surface Closer	PR7500	689	NO

4 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Wall Stop	406 / 409	US32D	RO
2 Door Stop & Holder	494-RKW	US26D	RO
2 Silencer	608 / 609		RO

Set: 5.0

Doors: 210.1

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Rim Exit Device, Passage	43 8815 ETND	US32D	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE

Set: 6.0

Doors: 108.1, 315.1

4 Hinge (heavy weight)	T4A3786	US26D	MK
1 Rim Exit Device, Passage	43 8815 ETND	US32D	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE

Set: 7.0

Doors: 010.1

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Flush Bolt	2845 / 2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Coordinator	2672	US28	RO
1 Filler Bar	FB-1 / FB-2	US28	RO
2 Surface Closer	7500 - pull side mount	689	NO
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE
1 Astragal	S772C		PE

Set: 8.0

Doors: 318.1

8 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Coordinator	2672	US28	RO
1 Filler Bar	FB-1 / FB-2	US28	RO
2 Mounting Bracket	2601D	US28	RO
2 Surface Closer	PR7500	689	NO
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE
1 Astragal	S772C		PE

Set: 9.0

Doors: 004.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO

Set: 10.0

Doors: 312.1

4 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO

Set: 11.0

Doors: 211A

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	CPS7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608 / 609		RO

Set: 12.0

Doors: 005.1, 006.1, 008.1, 009.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE

Set: 13.0

Doors: 206.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Entry/Office Lock	DG160 10XG05 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO

Set: 14.0

Doors: 208.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Entry/Office Lock	DG160 10XG05 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	PR7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO

1 Gasketing	S88BL		PE

Set: 15.0

Doors: 313.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	CPS7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Gasketing	S88BL		PE

Set: 16.0

Doors: 214.1

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Flush Bolt	2845 / 2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
2 Conc Overhead Hold Open	2-X26	652	RF
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Silencer	608 / 609		RO

Set: 17.0

Doors: 112.1

4 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO

Set: 18.0

Doors: 001.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	7500 - pull side mount	689	NO

1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE

Set: 19.0

Doors: 106.1, 106.2, 205A.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	PR7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Electromagnetic Holder	994M	689	RF
1 Gasketing	S88BL		PE

Notes:

Door to be normally held open on door / wall mounted magnetic hold open device. Magnetic hold open devices to release at activation of fire alarm.

Set: 20.0

Doors: 212.1, 213.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	LB V21 8265 LNND	US26D	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO
1 Coat Hook	796	US26D	RO

Set: 21.0

Doors: 316.1

4 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	LB V21 8265 LNND	US26D	SA
1 Surface Closer	7500 - pull side mount	689	NO

1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
3 Silencer	608 / 609		RO
1 Coat Hook	796	US26D	RO

Set: 22.0

Doors: 109.1, 110.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	LB V21 8265 LNND	US26D	SA
1 Surf Overhead Stop	10-X36	652	RF
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608 / 609		RO
1 Coat Hook	796	US26D	RO

Set: 23.0

Doors: 011.1

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Storeroom/Closet Lock	DG160 10XG04 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	7500 - pull side mount	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	S88BL		PE

Set: 24.0

Doors: 311.1

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Classroom Lock	DG160 10XG37 LND	US26D	SA
1 Core	DG1 6300 GMK	US15	SA
1 Surface Closer	PR7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Electromagnetic Holder	994M	689	RF

1 Gasketing	S88BL	PE

Notes:

Door to be normally held open on door / wall mounted magnetic hold open device. Magnetic hold open devices to release at activation of fire alarm.

Set: 25.0

Doors: 215.1

1 Hardware	- Provided with Fire Rated Aluminum assembly	OT

Set: 26.0

Doors: MISC

1 Key Cabinet	1200 Series x capacity as required	LU

END OF SECTION 08 0671

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.

15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.

2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All

technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.

2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

    a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on- center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) - CM Series.
    b. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.

3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 08 1113

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 083473 "Sound Control Door Assemblies" for acoustic flush wood doors.
2. Section 088000 "Glazing" for glass view panels in flush wood doors.
3. Section 134900 "Radiation Protection" for lead-lined flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Graham Wood Doors; an Assa Abloy Group company.
3. Mohawk Doors; a Masonite company.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards.

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Regional Materials: Flush wood doors shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Flush wood doors shall be manufactured within 500 miles (800 km) of Project site.

D. Certified Wood: Flush wood doors shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

E. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

F. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: All doors to meet this criteria.

H. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

I. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

J. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

K. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).

L. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

M. Hollow-Core Doors:

1. Construction: Institutional hollow core.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: White Maple
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Core: Either glued or nonglued wood stave or structural composite lumber.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering
9. Construction: Seven plies, either bonded or nonbonded construction.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

C. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Air Louvers, Inc.
    b. Anemostat; a Mestek company.
    c. L & L Louvers, Inc.
    d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
    e. McGill Architectural Products.

2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent finish.

C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-4 conversion varnish.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 08 7100 "Door Hardware.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

    a. Comply with NFPA 80 for fire-rated doors.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 08 1416

SECTION 083513 - FOLDING DOORS (Alternate Bid Item)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Accordion folding doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 ACCORDION FOLDING DOORS

A. Description: Top-supported, horizontal-sliding, manually operated accordion folding doors, with chain controlling the spacing and extension of pantographic or X-type accordion folding frames.

1. Modernfold Soundmaster 8 or approved equal.

B. Covers: Attached to accordion folding frames with concealed fasteners that allow on-site cover removal and repair.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25
b. Smoke-Developed Index: 50

2. Vinyl Cover Material: Reinforced with woven backing weighing not less than [20 oz./linear yd.

a. Color, Texture, and Pattern: As selected by Architect from manufacturer's full range

C. Sweep Seals: Located at top and bottom on both sides of door.

D. Carriers: Four-wheel carriers at lead post and two-wheel carriers at intermediate spacing. Wheels are ball-bearing type and equipped with nylon tread and steel shafts.

E. Tracks: Limit track deflection, independent of structural supporting system, to no more than 80 percent of bottom clearance. Provide the following features:

1. Recessed Surface mounting.
2. Ceiling guard.
3. Center stop for center-opening doors.

F. Jamb Molding: At closing jamb as required for light-tight jamb closure.

1. Jamb Strip: Nonferrous for end-opening doors.

G. Tiebacks: To maintain door in stacked position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install folding doors complying with manufacturer's written installation instructions. Install track in one piece.

B. Standard Floor Clearances: 1/4 to 3/4 inch (6.4 to 19 mm) maximum (above floor finish).

END OF SECTION 08 3513

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Storefront framing for punched openings.
   3. Exterior and interior manual-swing entrance doors and door-frame units.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:

      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glazing-to-glazing contact.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.

B. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft.of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

D. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

E. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.

F. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

E. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise 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.

D. Accessible Entrances: Comply with applicable provisions in ICC/ANSI A117.1.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Hardware: Contractor shall provide this subcontractor with approved hardware information and template drawings for doors to be installed in aluminum frames. Contractor will be completely responsible for coordination between the hardware supplier and this subcontractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

    a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

2. Entrance Doors:

    a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources

other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than the value indicated in the 2009 International Code Council's International Energy Conservation Code for aluminum-framed window systems, entrance doors, and windows.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
b. Low Exterior Ambient-Air Temperature: 0 deg F.
c. Interior Ambient-Air Temperature: 75 deg F.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Kawneer North America; an Alcoa company Trifab VG 451T (Basis of Design)
   2. EFCO Corporation.
   3. Tubelite.
   4. YKK AP Inc.

2.3 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

   1. Construction: Thermally broken for exterior applications, non-thermal for interior applications.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: As indicated

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 GLAZING SYSTEMS

A. Glazing: Comply with Section 08 8000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1¾ inch overall thickness, with minimum 0.188-inchhick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated on Drawings.

a. Accessible Doors: Smooth surfaced for width of door in area within 12 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: Prepare for, receive and install finish hardware as specified in Division 08 Section "Finish Hardware."

C. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

E. Silencers: BHMA A156.16, Grade 1.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.

2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.5 CLEANING

A. Immediately prior to acceptance of the work, remove all protective materials and clean all exposed members.

B. Clean with materials free of abrasives or harmful cleaning agents.

3.6 PROTECTION

A. Protect all finished surfaces as necessary to prevent damage during progress of the work.

END OF SECTION 08 4113

SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 – GENERAL

1.0 STIPULATIONS

A. The Drawings and General Provisions of the contract, including General Conditions, Special Requirements, and Division I Specification Sections, form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.1 WORK INCLUDED

A. Furnish and install architectural aluminum curtain wall complete with related components as shown on drawings and specified in this section.

B. Glass

1. Reference Div 08 Section for Glass and Glazing.

C. Single Source Requirement

1. All products listed in Section 1.02 shall be by the same manufacturer.

1.2 RELATED WORK

A. Div 08 - Entrances and Storefronts

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

a. Glazed aluminum curtain walls shall withstand movements of supporting structure[indicated on Drawings] including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

b. Failure also includes the following:
   i. Thermal stresses transferring to building structure.
   ii. Glass breakage.
   iii. Noise or vibration created by wind and thermal and structural movements.
   iv. Loosening or weakening of fasteners, attachments, and other components.
   v. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind Loads: 20 psf

D. Structural-Test Performance: Test according to ASTM E 330 as follows:
   a. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   b. Test Durations: 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:
   a. Deflection Normal to Wall Plane: Limited to [edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
   b. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
   c. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than [6.24 lbf/sq. ft. (300 Pa).

G. Energy Performance: Glazed aluminum curtain wall shall have certified and labeled energy performance ratings in accordance with NFRC.

H. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have winter U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
   a. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than .44 as determined according to NFRC 200. See Div 08 Glass for glazing for fixed glass specification.
   b. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

1.4 QUALITY ASSURANCE

A. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.05.

B. Test reports shall be accompanied by the curtain wall manufacturer's letter of certification stating that the tested curtain wall meets or exceeds the referenced criteria for the appropriate curtain wall type.

1.5 SUBMITTALS

A. Contractor shall submit (4) copies of all shop drawings to the Professional for his approval. Drawings shall show scale elevations and sections. Full size sections shall be shown only when needed for clarity. Drawings shall show construction of all parts of the work, including metal and glass thickness, methods of joining, details of all field connections and anchorage, fastening and sealing methods, metal finishes, and all pertinent information. Relationship to other work should be clearly indicated. No work shall be fabricated until shop drawings for that work have been finally approved for fabrication.

B. Contractor shall submit finish samples, test reports, and warranties.
   1. Samples of materials as may be requested without cost to owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, corner section, etc.

C. Installer qualifications and certification.

1.6 DELIVERY, STORAGE AND HANDLING

1.7 WARRANTIES

A. Total Curtain Wall System

1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total curtain wall installation. This includes the glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water, and structural adequacy and the specifications and approved shop drawings.
2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at his expense during the warranty period.

PART 2 – PRODUCTS

Basis of Design: Curtain Wall System shall be Kawneer 16020 series, Outside Glazed. Other accepted manufacturers when meeting or exceeding requirements include:

A. EFCO Corporation system with thermally broken frame
B. Tubelite system with thermally broken frame
C. YKK AP, Inc. system with thermally broken frame

2.1 MATERIALS

A. Aluminum

1. Extruded aluminum shall be 6063-T5 or T6 alloy and temper.

B. Glass

1. Insulated glass Basis of Design: Solar Ban 60, 1" thick insulated unit as manufactured by PPG consisting of (¼") exterior, (½") air spacer, and (¼") interior. See Div 08 Glazing specification section for performance requirements.

C. Dissimilar Metals

1. All dissimilar metals must be properly insulated to prevent galvanic action.

D. Fasteners

1. All exposed fasteners shall be aluminum, stainless steel, or zinc plated steel.

E. Anchors

1. Perimeter and floor line anchors shall be aluminum or steel. All steel anchors shall be properly insulated from the aluminum.

F. Thermal Barrier

1. The thermal barrier shall be extruded PVC used as an applied thermal isolator.

2.2 FABRICATION

A. General

1. All aluminum vertical and horizontal extrusions shall have a minimum wall thickness of .093" to .125".

B. Frame

1. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
2. Curtain wall system shall be able to accommodate separate interior and exterior finishes and colors.

C. Glazing

1. Outside glazed curtain wall system shall be dry glazed with an exterior aluminum pressure plate and snap cover with interior and exterior dense EPDM preset gaskets.

D. Finish

1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 – EXECUTION

3.1 INSPECTION

A. Job Conditions

1. All openings shall be prepared by others to the proper size and shall be plumb, level, and in the proper location and alignment as shown on the Professional's drawings.

3.2 INSTALLATION

A. Use only skilled tradesmen with work done in accordance with approved shop drawings and established specifications, and erect all curtain wall components to all building benchmarks and column centerlines.

B. Plumb and align curtain wall faces in a single plane for each wall plane, and erect curtain wall materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, building movement, and specified wind loads.

C. Adjust windows in curtain wall for proper operation after installation.

D. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material; leave all exposed surfaces and joints clean and smooth.

3.3 ANCHORAGE

A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 PROTECTION AND CLEANING

A. The general contractor shall protect the aluminum materials and finish against damage from construction activities and harmful substances. The general contractor shall remove any protective coatings as directed by the Professional, and shall clean the aluminum surfaces as recommended for the type of finish applied.

END OF SECTION 08 4413

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SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. Hager Companies (HA) - BB Series, 5 knuckle.
   b. McKinney (MK) - TA/T4A Series, 5 knuckle.
   c. dormakaba Best (ST) - F/FBB Series, 5 knuckle.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

   a. Hager Companies (HA).
   b. Pemko (PE).
   c. Dormakaba Best (ST).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

   a. Ives (IV).

b. Rockwood (RO).
c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

6. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.

5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer's Standard.

C. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.

2. Manufacturers:

a. Corbin Russwin (RU) - Access 3 AP.
b. Sargent (SA) - Degree DG1.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

    1. Heavy duty mortise locks shall have a ten-year warranty.

    2. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180-degree viewing angle with protective covering to prevent tampering.

    3. Manufacturers:

        a. Corbin Russwin Hardware (RU) - ML2000 Series.
        b. Sargent Manufacturing (SA) - 8200 Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

    1. Heavy duty cylindrical locks shall have a seven-year warranty.

    2. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).

    3. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

    4. Locks are to be non-handed and fully field reversible.

    5. Manufacturers:

        a. Corbin Russwin Hardware (RU) - CLX3300 Series.
        b. Sargent Manufacturing (SA) - 10X Line.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

11. Rail Sizing: Provide exit device rails factory sized for proper door width application.

12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

   1. Manufacturers:

      a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
      b. Sargent Manufacturing (SA) - 80 Series.
      c. Von Duprin (VD) - 35A/98 XP Series.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

   1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

   2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

   3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible

to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Norton Rixson (NO) - 7500 Series.
   c. Sargent Manufacturing (SA) - 351 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

   a. Corbin Russwin Hardware (RU) - Unitrol Series.
   b. Norton Rixson (NO) - Unitrol Series.

2.10 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

a. Norton Rixson (RF) - 980/990 Series.
b. Sargent Manufacturing (SA) - 1560 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TC).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final

operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 08 7100

SECTION 08 8000 GLAZING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The Drawings and General Provisions of the contract, including General Conditions, Special Requirements, and Division I Specification Sections, form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows
2. Doors
3. Glazed entrances
4. Interior borrowed lites
5. Storefront framing

B. Related Sections include the following:

1. Division 8 Section "Aluminum Windows."
2. Division 8 Section "Aluminum Entrances and Storefronts."
3. Division 8 Section “Aluminum Curtain Walls”

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings
   b. Specified Design Snow Loads: Not less than snow loads applicable to Project, required by ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 6.4.2, “Analytic Procedure,” based on mean roof heights above grade indicated on Drawings.
   c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      1) Load Duration: 60 seconds or less.
   d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
      1) Load Duration: 30 days.
   e. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
      1) For monolithic-glass lites heat treated to resist wind loads.
      2) For insulating glass.
      3) For laminated-glass lites.
   f. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm
   g. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
3. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
4. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
5. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

a. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Float Glass
2. Tempered Glass
3. Wired Glass
4. Insulating glass for each designation indicated.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and owners, and other information specified.

F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Insulating Glass
2. Glazing gaskets

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer

C. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

F. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

G. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

H. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide".
2. AAMA Publications: AAMA GDSG-1 “Glass Design for Slopered Glazing,” and AAMA TIR A7, “Sloped Glazing Guidelines.”
3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Associated Laboratories, Inc.

K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. 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.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements manufacturer’s offering, products that may be incorporated into the Work include the following:

1. Primary Float Glass
   a. Pittsburgh Corning Corp.
   b. LOF (Libbey-Owens-Ford) Co.
   c. PPG Industries Inc.
   d. Falconer Glass Industries
2. Heat Treated Float Glass
   a. Pittsburgh Corning Corp.
   b. LOF (Libbey-Owens-Ford) Co.
   c. PPG Industries Inc.
   d. Falconer Glass Industries
4. Insulated Glass
   a. Pittsburgh Corning Corp.
   b. LOF (Libbey-Owens-Ford) Co.
   c. PPG Industries Inc.
   d. Falconer Glass Industries
5. Ceramic Frit: Screen printed glass/horizontal lines
   a. Dlubak Corporation
   b. Viracon Corporation
   c. Sumiglas

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated.

2.3 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as required by the applicable glazing code.

2.4 INSULATING GLASS

Insulating-Glass Units **Basis of Design: "Solarban®" 60** (2) Clear + Clear by PPG Industries, Inc.

A. Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article.

1. Insulated units consist of two ¼" thick lites or annealed glass, separated by ½" sealed air space. "Solarban®" 60 (2) Clear + Clear by PPG Industries, Inc.
2. Outdoor Lite: Clear Glass, Sputter Coated on second surface (2)
3. Indoor Lite: Clear Float Glass
4. Low-E Coating: "Solarban" 60 Solar Control (Sputtered) by PPG Industries, Inc.
5. Location: Second Surface (2)
6. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is required by the applicable glazing code.

Performance Values

Visible Light Transmission	U-Value Winter	U-Value Summer	SHGC	Shading Coefficient	Outdoor Visible Light Reflectance
70%	0.29	0.27	0.38	0.44	11%

B. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.

C. Spacer Specifications: Manufacturer's standard spacer material and construction.

D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

1. Aluminum with mill or clear-anodized finish.
2. Desiccant: Molecular sieve or silica gel, or blend of both.
3. Corner Construction: Manufacturer's standard corner construction.

2.5 FIRE-PROTECTION-RATED GLAZING & FRAME

1. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 for window assemblies. **Provide 2 hr fire rated glass and frame assembly assembly.**

2. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 1-1/2 inch (5-mm) nominal thickness; faced on one surface with a clear glazing film; complying with testing requirements in 16 CFR 1201 for Category II materials.

    1) Products: Basis of Design: Safti First; SuperLite II-XL 120 min fire rating.

    b. Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

        Safti First

        1) Schott North America, Inc.

        2) Vetrotech Saint-Gobain

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing..

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.5 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 8000

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SECTION 08 8300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Gypsum Board 09 29 00

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Annealed monolithic glass mirrors.
2. Film-backed glass mirrors qualifying as safety glazing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches (300 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction test reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with GANA's "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Safety Glazing Products: For film-backed mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

C. Comply with ASTM C 1503-01

D. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Donisi Mirror Company.
   b. Gardner Glass, Inc.
   c. Guardian Industries.
   d. Lenoir Mirror Company.
   e. Stroupe Mirror Co., Inc.
   f. Virginia Mirror Company, Inc.

B. Clear Glass: Mirror Select Quality.

1. Nominal Thickness: 6.0 mm

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Approved by mirror manufacturer.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.

1. Adhesive shall have a VOC content of not more than **70** g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Finish: Clear bright anodized.

B. Mirror Bottom Clips: 16 gage nickel plated steel rounded lip mirror clip as at intervals recommended by manufacturer

C. Mirror Top Clips: 16 gage nickel plated steel rounded lip mirror clip as at intervals recommended by manufacturer

D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

E. Anchors and Inserts: Provide devices as required for mirror hardware installation.

2.4 FABRICATION

A. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

B. Mirror Edge Treatment: Rounded polished. Seal edges of mirrors with edge sealer.

C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

B. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

C. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

D. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware as indicated on the architects drawings. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.

E. Protect mirrors from breakage and contaminating substances resulting from construction operations.

F. Do not permit edges of mirrors to be exposed to standing water.

G. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

H. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product provide:
1. Manufacturer's Installation Instructions.
2. Product data describing standard framing members, materials and finish, product criteria, load charts, and limitations.

B. Shop Drawings: Provide drawings to indicate:
1. Prefabricated work, component details, framed openings, anchorage to structure, type of fasteners, and accessories or items required of other related work.
2. Description method of securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.

B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

A. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

1. Minimum Base-Metal Thickness: 20 ga, 0.033 inch (0.84 mm) unless otherwise noted on drawings.
2. Depth: As indicated on Drawings

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dale Industries, Inc.

2) Dietrich Industries, Inc.

3) Marino/Ware (formerly Marino Industries Corp.).

4) National Gypsum Co.; Gold Bond Building Products Division.

5) Unimast, Inc.

B. Slip-Type Head Joints: Provide the following track at the underside of floor structural system in thickness not less than indicated for studs and in width to accommodate depth of studs:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; Slotted Deflection Track.
3) Steel Network Inc. (The); VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track

C. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the 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. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

a. Fire Trak Corp.; Fire Trak System[attached to studs with Fire Trak Posi Klip].
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm)

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth1-1/2 inches (38 mm)
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch
2. Depth: As indicated on Drawings

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: hat shaped

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E 488.

a. Type: Cast-in-place anchor, designed for attachment to concrete forms or Postinstalled, expansion anchor

2. Powder-Actuated Fasteners: Capable of sustaining, a load equal to 10 times that imposed as determined by ASTM E 1190.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet 1 by 3/16 inch (25 by 5 mm) by length required.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

a. Minimum Base-Metal Thickness: 20 ga., 0.033 inch (0.84 mm)].
b. Depth: As indicated on Drawings

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm)

4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Configuration: hat shaped

2.4 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

2. United States Gypsum Construction Handbook, Sixth Edition for industry standard assemblies.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Control Joints: Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently. Control Joint spacing shall be:
   1. 30-ft o. c. max
   2. Provide layout of typical control joint locations for architect Review and approval.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

      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 (610 mm) o.c.

F. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches.
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 (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
3. Do not attach hangers to steel roof deck.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. 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 2216

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SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Shaft wall liner.
5. Accessories.

B. Related Requirements:
1. Section 09 2216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Section 09 2116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
3. Section 09 3000 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corp.
2. Georgia-Pacific Gypsum LLC.
3. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch unless indicated otherwise on Drawings.
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch.

2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 1.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; GlasRoc Sheathing.
b. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
c. USG Corporation; Securock Glass Mat Sheathing.

2. Core: 1/2 inch, regular type.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
a. CertainTeed Corp.; FiberCement BackerBoard.
b. Custom Building Products; Wonderboard.
c. National Gypsum Company, Permabase Cement Board.
d. USG Corporation; DUROCK Cement Board.
2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.
1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.
a. Core: 1 inch thick.
b. Long Edges: Double bevel.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
2. Shapes:
a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
   b. Pecora Corporation; AC-20 FTR.
   c. USG Corporation; SHEETROCK Acoustical Sealant.

F. Thermal Insulation: As specified in Section 07 2100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite

sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Abuse-Resistant Type: As indicated on drawings.
5. Moisture- and Mold-Resistant Type: All Shower, Toilet and Locker Rooms except at locations indicated to receive tile.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings and as required for a complete installation.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 09 9100 "Painting."

4. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in Section 099100 "Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 2900

SECTION 09 3000 – CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Ceramic floor tile
   2. Ceramic tile base
   3. Ceramic wall tile
   4. Metal thresholds
   5. Waterproof membrane
   6. Cleavage membrane
   7. Crack isolation membrane
   8. Metal edge strips

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Division 09 Section "Gypsum Board" for cementitious backer units and glass-mat, water-resistant backer board.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Module Size: Actual tile size plus joint width indicated.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

B. Samples:
1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch lengths.

C. Product Certificates: For each type of product, signed by product manufacturer.

1.6 QUALITY ASSURANCE

A. Tile Council of America, Inc., "Handbook for Ceramic Tile Installation," latest edition;

B. American National Standards Institute (ANSI) "American National Standard Specifications for Ceramic Tile - ANSI-137.1."

C. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Waterproof membrane.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated but no less than one carton of each type and color. Box for storage, date, and mark the box "maintenance tile".

C. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Manufacturers:
   1. Basis of Design: Daltile.
   2. Acceptable Alternatives: American Olean and Garden State.

B. Ceramic Tile types as indicated on drawings.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Threshold: As indicated on Drawings.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 40 mil nominal thickness.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Noble Company (The); Nobleseal “Chloraloy 240”

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for heavy duty performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 30 mil nominal thickness.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Noble Company (The); Nobleseal CIS.

2.6 CLEAVAGE MEMBRANE

A. Cleavage Membrane: 15 pound roofing felt ASTM D 226, for use under full set tile locations on slab on grade, unless other material is indicated on the Drawings or specified.

2.7 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bonsal American; an Oldcastle company.
      b. Bostik, Inc.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.

   2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
   3. Provide prepackaged, dry-mortar mix combined with [liquid-latex additive at Project site.
   4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide “Classic Collection” and “Designer Series” as manufactured by MAPEI Corporation or comparable product by one of the following:
      a. Bonsal American; an Oldcastle company.
      b. Laticrete International, Inc.
      c. Southern Grouts & Mortars, Inc.
      d. Summitville Tiles, Inc.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.9 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
   1. Use sealants that have a VOC content of [250] <Insert limit> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
   1. Products: Subject to compliance with requirements, provide the following or approved equal:
      a. Dow Corning Corporation; Dow Corning 786TR-WHT.

2.10 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

   1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. 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.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments. Use bullnosed shapes to terminate tile except at inside corners.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

   1. Ceramic Mosaic Tile and Cove Base: 1/8 inch.
   2. Wall Tile: Per manufacturer’s written instruction.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings and as follows.

Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where tile floors abut vertical surfaces such as bases, walls, curbs, etc., provide 1/4 inch wide control joints, full depth through the ceramic tile and under bed, to receive control joint sealant.
2. At building control points, between ceramic tile and metal door frames and between ceramic tile and marble thresholds.
3. Control joints shall also be located directly over joints in concrete slabs. Joints shall be in accordance with the "Handbook for Ceramic Tile Installation" of the Tile Council of America, EJ171-06. Base/cove installation shall be "Flush" as indicated in the "Handbook for Ceramic tile Installation."
4. All control joints shall be left open, protected and maintained clean to receive the control joint sealant and backing.
5. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Metal Edge Strips: Install [at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and hazes from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other

surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 TILE INSTALLATION SCHEDULE

A. Ceramic tile installation shall be in accordance with the following methods from the “Handbook For Ceramic Tile Installation," of the Tile Council of America, Inc., Latest Edition:

1. Thin-set floor: F113 with wet-cured, Latex-Portland cement/sand grout (1 pc = 1 sand) with crack protection sheet;
2. Thin-set, wall: W243.

B. All work shall be laid out to minimize cutting. Where cutting is required, tile shall be neatly cut and fitted with edges ground smooth.

C. Reinforce setting beds over waterproofing and cleavage membranes with the specified mesh reinforcing. Do not install tile floors over membrane until the membrane has been tested and accepted.

D. Apply silicone sealant at top edge of ceramic and quarry base between wall surface and base.

E. Use a grout release coating product as approved by the tile manufacture.

F. Limits of tile:

1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.
2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
3. Use bullnose shapes to terminate tile except at inside corners.

END OF SECTION 09 3000

SECTION 09 3000 - ACOUSTICAL PLASTER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. The work described in this Section, as shown on Drawings, Finish Schedules, or as specified herein, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work in this Section includes all labor, materials, equipment, and services necessary to complete the Sound Absorptive (Acoustical) Plaster System, as shown on the drawings, finish schedules, and / or defined and specified herein.

1.3 RELATED SECTONS

A. Carpentry – See Div 06

B. Gypsum Board – See Div 09

1.4 QUALITY ASSURANCE

A. Certified Installers:

1. All Contractors shall be certified to install the - Acoustical Plaster System by BASWA acoustic North America, LLC (BASWA acoustic) (440.951.6022) or approved equal.

1.5 SUBMITTALS

A. Product Data:

B. Samples / Mock-Up:

1. Provide two 8-1/2” x 11” samples of the - Acoustical Plaster System in color as noted in Section 2.1 below. Samples must show the randomly spun mineral wool backing.

2. Job Site Mock-Up: Install a 4’ x 4’ mock-up of the - Sound Absorptive Plaster System replicating relative details and conditions. Obtain mock-up acceptance before any additional applications. Accomplish work to equal or exceed standard established by accepted job site mock-up.

C. Acoustical Performance Data:

1. Certified Acoustical Performance Sound Absorption Test Report data, conducted by a recognized, independent, testing agency, shall be submitted upon request and meet the following minimum requirements. Noise Reduction Coefficient (NRC) for the 1 - 3/16" (30mm) system shall be 0.80 per ASTM C 423-17 *Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method for 'Type A' Mounting*. Specific performance of the 1 - 3/16" sound absorptive system shall be as follows:

Frequency, Hz	Absorption Coefficient
80	0.02
100	0.05
125	0.1
160	0.15
200	0.2
250	0.3
315	0.54
400	0.7
500	0.86
630	0.99
800	1.03
1000	1.06
1250	1.04
1600	0.99
2000	0.92
2500	0.89
3150	0.81
4000	0.78
5000	0.77

D. Fire Test Data:

1. Certified Reports on Surface Burning Characteristics Determined by ASTM E 84 *Twenty-Five Foot Tunnel Furnace Test Method*, conducted by a recognized, independent, testing agency, shall be submitted upon request and meet the following minimum requirements:

    a. Class A Flame Spread Classification
        1. 25 Flame Spread or less
        2. 10 Smoke Development or less

E. Mold Test Data

1. Certified Reports from an independent, testing agency, shall be submitted upon request and meet the following minimum requirements:

    a. Testing per ASTM D 3273-16
        1. 10 / 10 – Week 4 – No Defacement

    b. Testing per ASTM G – 21 F, attaining a rating of 0.

F. Light Reflectance Coefficient Test Data:

1. Certified Reports on Light Reflectance Coefficient Performance Determined by ASTM E *1477-98 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer*, conducted by a recognized, independent, testing agency, shall be submitted upon request and meet the following minimum requirements:

a. Light Reflectance Value
1. Light Reflectance Value 'L' a minimum of 0.91.

G. VOC Emission Test Data:

1. Test Certificate from an independent testing certificate for California Department of Public Health CDPH / EHLB / Standard Method Version 1.2, 2017

a. School Classroom - Compliant
b. Private Office – Compliant

H. R-Value:

1. R-Value – 5.13 or greater

1.6 REFERENCES

A. ASTM C 423-17: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 'Type A' Mounting.

B. ASTM E 795-16: Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

C. ASTM E 84: Standard Test Method for Surface Burning Characteristics and Building Materials. Class A Fire Rating.

D. ASTM C842, Specification and Standards for Application of Interior Gypsum Plaster.

E. ASTM E 1477-98 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer.

F. VOC Test - California Department of Public Health CDPH / EHLB / Standard Method Version 1.2, 2017

G. ASTM D 3273-16, ASTM G – 21 B, and ASTM G – 21 F Mold Resistance and Fungal Resistance Test

1.7 DELIVERY, STORAGE AND HANDLING

A. Ship and deliver in protective packaging to prevent freight damage.

B. Allow materials to become acclimated to Project conditions before installation.

C. Store materials in accordance with manufacturer's recommendations in a fully enclosed space where materials will be protected against damage from moisture, surface contamination and other causes. All wet work must be completed in area of storage.

D. Protect ACOUSTICAL PLASTER Base from freezing. Product that has frozen cannot be used and is not warranted.

1.9 PROJECT CONDITIONS

A. Environmental Requirements: Comply with requirements of referenced plaster application standards and recommendations of product manufacturer for environmental conditions before, during, and after installation.

B. Temperature Requirements: Where ambient outdoor temperature at the building site is less than 55º F (13º C), a temperature of not less than 55º F and not more than 80º F shall be maintained continuously in the area of the installation for a period of not less than one week prior to the application of - Acoustical Plaster System. Temporary heat shall be evenly distributed to prevent concentrated uneven heat or cold on the - Acoustical Plaster System or its substrate. Acceptable temperature range shall be maintained until the permanent HVAC system is activated.

C. Ventilation: Ventilate building spaces as required to remove excess moisture to promote drying of the applied materials.

D. Protect contiguous work form soiling, splattering, moisture deterioration, and other harmful effects that may be caused by the application of the materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and installation shall be based upon the - Acoustical Plaster System's performance, specifications, information, and details as supplied by BASWA acoustic North America, LLC, 21863 Aurora Rd., Cleveland, OH 44146, www.baswana.com, (440.951.6022). Other products and installers must meet the design and performance criteria described herein or approved equal.

B. The Sound Absorbing Plaster System shall be provided in a total system thickness (adhesive, Pre-Coated mineral wool panels, Base Coat, and Base finish coat) of approximately 1 - 3/16" (30mm).

C. The Acoustical Plaster System shall consist of Pre-Coated mineral wool supporting panels, ACOUSTICAL PLASTER panel adhesive, ACOUSTICAL PLASTER Fill, a

base coat of ACOUSTICAL PLASTER Base, and a finish coat of ACOUSTICAL PLASTER Base.

D. Trim Pieces:

1. All corner beads, terminations, control joints, or other trim pieces shall be white vinyl ACOUSTICAL PLASTER proprietary beads. Specialty beads and reveals in profiles approved by the acoustical plaster mfr shall be white vinyl beads manufactured by either Trim Tex or Vinyl Corp. Trims shall be installed with Trim-Tex 847 Spray Adhesive; no other adhesive is approved.

E. The Base coats shall be provided in the standard ACOUSTICAL PLASTER “natural white” color.

F. ACOUSTICAL PLASTER Protect Surface Protection:

1. A spray application of Protect Surface Protection, supplied by the acoustic plaster manufacturer, shall be applied to the finished surface after system has completely dried for a minimum of 12 hours. The non-bridging granulate coating resists stains and improves cleanability without negatively affecting acoustical absorption. Application and coverage shall be per manufacturer’s approved application guidelines.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas where, and conditions under which, the - Acoustical Plaster System is to be installed. Correct any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected in order to permit the proper installation of the work.

B. Verify that all mechanical and electrical services within the area of application have been roughed in at the appropriate depth relative to the thickness of the system; tested and approved, prior to commencement of application. Review approved details provided by acoustical plaster mfr for verification.

3.2 ACCEPTABLE SUBSTRATE

A. General:

1. The Acoustical Plaster Systems must be installed over a gypsum board stable substrate. All penetrations shall be “closed off” to prevent air from passing through the Acoustical Plaster System, thereafter through the substrate and then into the plenum above, or vice versa.

2. All HVAC, electrical, fire sprinkler, and other penetrations of the substrate shall be sealed with traditional drywall tape or a self-adhesive fire tape to prevent air movement between the plenum and finished space or vice versa.

3. Adhesive Strength required for bonding to the substrate surface for the application of the - Acoustical Plaster System is a minimum of 17 N/psf.

4. Plywood substrates are not acceptable due to the potential of excessive expansion and contraction movement.

5. All substrates for the application shall not vary from plumb, level, or a “smooth consistent curvature” by more than a total of 1/4 inch in 12 feet.

B. Substrate Material:

1. Drywall substrates receiving the full Acoustical Plaster System shall be a Level One finish; taped only.

2. Drywall substrates receiving Acoustical Plaster Base Coats only, *located in a different plane than those areas receiving the full - Acoustical Plaster System*, shall be a Level Four finish; taped, coated, and sanded. Substrate shall be primed with drywall latex.

3.3 INSTALLATION

A. General Information and Requirements:

1. Hand Tools:

a. All application of - Pre-Coated mineral wool panels, Fill, and Base coats must be facilitated by using the proper stainless steel flat or notched hand trowels supplied by acoustical mfr. The proper notched gauging trowels and smoothing trowels shall be used at each step noted below in order to control material thickness.

2. Graco Pump (Optional):

a. The ACOUSTICAL PLASTER Base Coats may be applied by using traditional hawk and trowel methods; however, use of the Graco RTX 5000PX, dramatically increases production and greatly reduces product waste. The proper notched gauging trowels and smoothing trowels shall be used at each step noted below in order to control material thickness. Graco pump is supplied by ACOUSTICAL PLASTER acoustic, Sherwin-Williams, or Graco, Inc.

3. Lighting:

a. Inherent in all hand troweled product applications, minor acceptable trowel marks or imperfections in the finished surface may occur and become exposed or “exaggerated” under critical lighting. Ensure that the lighting used during the entire installation process replicates the actual finished lighting. All skylights, clearstory windows and other openings which naturally light the area of the installation shall be uncovered during the entire installation in order to represent finished conditions.

4. Drying Times:

    a. Drying times for the ACOUSTICAL PLASTER panel adhesive, Fill, and Base coats are typically overnight, however, drying times may be longer due to unusual on-site conditions. Prior to proceeding with any additional work, ensure ACOUSTICAL PLASTER panel adhesive, Fill, and Base is completely and thoroughly dry.

5. Finished Coat Installation:

    a. Application of the ACOUSTICAL PLASTER Base finish coat shall be facilitated in one operation at each area of installation; “cold joints” in the finish coat are not acceptable.

6. Staging:
    a. Generally, the - Acoustical Plaster System is installed using full “tiered scaffolding with outriggers” on wall applications and / or a full “dance floor scaffolding” on ceiling applications in order to achieve an acceptable finish without ‘cold joints”. Rolling tower scaffolds which can be moved across an installation area may also be acceptable.

7. Access Doors in -:

    a. Access Doors used in the - Acoustical Plaster System can be flanged or “trim less”. Trim less access door model number 5020, sized as required, manufactured by Acudor Products Inc. (800.722.0501) or similar. Install per detail approved by ACOUSTICAL PLASTER mfr.

8. Securing to -:

    a. Light fixtures, ornamentation, speakers, cover plates, or any other items cannot be attached to the - Acoustical Plaster System. Ensure items are secured to proper blocking or other attachment system independent of the - Acoustical Plaster System per details approved by acoustical mfr.

B. Installation Procedures:

1. Install - Acoustical Plaster System materials in accordance with acoustic's installation instructions and details. Installation shall start only after all other work in the area of the installation has been completed.

    a. Pre-Coated Mineral Wool Panels:

        1. A field applied 2mm thick layer of adhesive is applied to the mineral wool back face of the 26mm thick Pre-Coated panel. Panel is pressed firmly onto and fully adhered to the stable substrate. Ensure that panels are set as level and as smooth to each other as practicable. Stagger joints between panels.

    b. Trim:

        1. Install white vinyl system trim pieces. Trims shall be installed with Trim-Tex 847 Spray Adhesive; no other adhesive is approved.

    c. Fill:

        1. Fill seams between - Pre-Coated panels with ACOUSTICAL PLASTER Fill and cover all white vinyl trim with ACOUSTICAL PLASTER Fill. Sand Fill smooth when completely dry.

    d. Base (Natural White):

        1. Prior to applying the layer of ACOUSTICAL PLASTER Base, ensure product is thoroughly mixed and all pails for each separate area are batched together in order to provide even consistent coloring. Apply a 2.0 – 3.0mm thick layer and trowel smooth. Sand smooth when completely dry.

    e. Base Finish Coat (Natural White):

        1. Prior to applying the finish layer of ACOUSTICAL PLASTER Base coat, ensure product is thoroughly mixed and all pails for each separate area are batched together in order to provide even consistent coloring. Apply a 0.5 – 1.0mm thick layer of ACOUSTICAL PLASTER Base coat and trowel smooth to a quality level consistent with accepted samples or mock-up. Note that ACOUSTICAL PLASTER is a hand troweled finished product. Inherent in all hand troweled product applications, minor acceptable trowel marks and other imperfections in the finished surface may occur which are only visible at certain times

of day or under certain critical lighting conditions. The finish should be critically viewed only under end-use lighting conditions

END OF SECTION 09 3000

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SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings., wire hangers, main runners, fasteners, and wall angle moldings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty

1. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

A. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.

B. Grid System: Rusting and manufacturer's defects

C. Acoustical Panels designated as inherently resistive to the growth of micro-organisms installed with suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Maintenance data.

C. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP.

B. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

B. Acoustical Panel Standard: Comply with ASTM E 1264.

C. Metal Suspension System Standard: Comply with ASTM C 635.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANELS

A. Type 1 [As indicated on Drawings]
   1. Armstrong World Industries, Inc: Subject to compliance with requirements, provide “Optima Square Tegular #3253” or comparable product by one of the following:
      a. CertainTeed Corp.
      b. Chicago Metallic Corporation.

c. USG Interiors, Inc.; Subsidiary of USG Corporation.
2. Composition: Mineral Fiber
3. Classification: 15/16" square
4. Color: White
5. LR: 88%
6. NRC: 1.00
7. AC: 200
8. Edge/Joint Detail: square
9. Thickness: 1-1/2 inch
10. Modular Size: 24 inches by 24 inches.

B. Type 2 [As indicated on Drawings]
1. Armstrong World Industries, Inc: Subject to compliance with requirements, provide "Optima, Square Tegular #3252" or comparable product by one of the following:
a. CertainTeed Corp.
b. Chicago Metallic Corporation.
c. USG Interiors, Inc.; Subsidiary of USG Corporation.
2. Composition: Mineral Fiber
3. Classification: 15/16" square
4. Color: White
5. LR: 88%
6. NRC: .95
7. AC: 190
8. Edge/Joint Detail: square
9. Thickness: 1 inch
10. Modular Size: 24 inches by 48 inches.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS

A. Armstrong World Industries: Subject to compliance with requirements, provide "Prelude XL, 15/16" or "Prelude 9/16", or comparable product by one of the following:
1. CertainTeed Corp.
2. Chicago Metallic Corporation.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. USG Interiors, Inc.; Subsidiary of USG Corporation: Subject to compliance with requirements, provide "DXLA", or comparable product by one of the following:
1. CertainTeed Corp.
2. Chicago Metallic Corporation.
3. Armstrong World Industries

C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 9/16-inch- (15-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate duty system.

2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush
4. Cap Material: Steel -rolled sheet.
5. Cap Finish: Painted white.

D. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

B. Proper design for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer’s instructions for installation and comply with the intent of the architects drawings.

B. Deliver ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way

E. Cut wood panel edges that are exposed to view will have to be treated to look like factory edges. Pre- finished peel and stick edge banding is recommended for this purpose

F. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

G. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
1. Ceiling Touch-Up Paint, "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 5113

SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Rubber stair accessories.
3. Rubber molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 THERMOSET-RUBBER BASE (RCB)

A. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location: as indicated on drawings.

B. Thickness: 0.125 inch (3.2 mm).

C. Height: 4 inches (102 mm)

D. Lengths: in manufacturer's standard length.

E. Outside Corners: Job formed

F. Inside Corners: Job formed

G. Colors: As indicated on drawings

2.3 RUBBER STAIR ACCESSORIES (RUB)

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Stair Treads: ASTM F2169.

1. Type: TS (rubber, vulcanized thermoset)
2. Class: As indicated on drawings.
3. Group: 2 (with contrasting color for the visually impaired).
4. Nosing Style: Square
5. Nosing Height: 1-1/2 inches (38 mm)
6. Thickness: 1/4 inch (6 mm) and tapered to back edge
7. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
8. Integral Risers: Smooth, flat; in height that fully covers substrate.

C. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers, produced by same manufacturer as treads, and recommended by manufacturer for installation with treads.

1. Thickness: Manufacturer's standard

D. Landing Tile: Matching treads, low profile raised circular design.

E. Locations: Provide rubber stair accessories in areas indicated on drawings.

F. Colors and Patterns: As indicated on architect’s drawings.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

    a. Miter corners to minimize open joints.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 09 6519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.
2. Rubber floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 SOLID VINYL FLOOR TILE (LVT); as indicated on drawings

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated on drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated on drawings.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

END OF SECTION 096519

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SECTION 09 6813 – CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:
   1. Modular carpet tile, as indicated on Drawings as “CPT”.
   2. Section includes walk off mat, as indicated on Drawings as “WOM”.

B. Related Sections include:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   2. Division 09 Section "Resilient Wall Base and Accessories" for materials and installation.
   3. Division 03 “Cast in Place Concrete”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated in this section and/or on the architect’s drawings.

B. Shop Drawings:
   1. General: Submit each item in this Article according to the Contract Documents
   2. Product Data for each type of carpet material, carpet cushion, and installation accessory specified. Submit manufacturers printed data on physical characteristics, durability, fade resistance, and fire-test-response characteristics. Submit methods of installation for each type of substrate.

   3. Show the following:
      a. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
      b. Type of subfloor.
      c. Type of installation.
      d. Pattern of installation.
      e. Pattern type, location, and direction.
      f. Pile direction.

C. Samples: Samples for verification of the following products, in manufacturers standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label each sample with manufacturers name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Submit the following:
   1. Full size samples of each type of carpet material required.
   2. 12 inch Samples of each type of exposed edge stripping and accessory item
   3. Schedule of carpet using same room designations indicated on Drawings

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floor covering Installers Association at the Commercial II certification level.

B. Single-Source Responsibility: Obtain each type of carpet from one source and by a single manufacturer.

C. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, section 5 “Storage and Handling”
   1. Deliver materials to Work site in original factory wrappings and containers, labeled with identification of manufacturer, brand name and lot number.
   2. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures and humidity. Lay flat, with continuous blocking off ground.

1.7 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Space Enclosure and Environmental Limitations: Do not install carpet until pace is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Special Carpet Warranty: Submit a written warranty executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, loss of face fiber, edge raveling, snags, runs, and delamination.

1.8 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: Commercial Lifetime.

1.9 EXTRA MATERIALS

1. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

2. Carpet: Before installation begins, furnish quantity of full-width units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT as designated on the architect's drawings)

A. Subject to compliance with requirements, provide products as designated on the Drawings, or product by one of the listed manufacturers as indicated on drawings.

2.2 WALK OFF MAT (WOM as designated on the architect's drawings)

A. Subject to compliance with requirements, provide products as designated on the Drawings, or product by one of the listed manufacturers as indicated on drawings.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the carpet manufacturer

3.2 PREPARATION

A. Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation
   1. Level subfloor within 1/4 inch in 10 feet, noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
   2. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the carpet manufacturer.
   3. Remove subfloor coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil or silicone.
   4. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust
   5. Concrete-Subfloor Preparation; Apply concrete slab primer, according to manufacturer’s directions where recommended by the carpet manufacturer. Verify that concrete slabs comply with ASTM F 710.

3.3 INSTALLATION

A. Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer. Confirm pattern installation method with architect.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non staining marking device.

G. Install pattern parallel to walls and borders.

H. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

I. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

3.4 CLEANING

A. Perform the following operations immediately after completing installation.
1. Remove visible adhesive, seam sealer, and other surfaced blemishes using cleaner recommended by carpet manufacturer.
2. Remove protruding yarns from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element,

3.5 PROTECTION

A. Comply with CRI 104, Section 15: "Protection of Indoor Installation."

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 6813

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SECTION 09 9100 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems.

B. Paint and finish all new and existing, exterior and interior exposed surfaces throughout the building as indicated on the Drawings, as listed on the Painting Schedule in Part 3 of this Section, as specified herein, and as needed for a complete and proper installation.

C. Work not included:
   1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces and the area above suspended ceilings;
   2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section unless otherwise indicated;
   3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sensing devices, and motor shafts, unless otherwise indicated;
   4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates;
   5. Metal surfaces of pre-finished galvalume and galvanized steel, metal roofing, metal fascia and trims, metal siding, metal ceiling, all galvanized bollards, all exposed zinc coated steel plates, anchors, and fasteners, etc. that have galvalume or galvanizing will not require painting under this Section unless otherwise indicated.

D. Definitions: "Paint" or “Epoxy” as used herein, means coating systems materials including primers, emulsions, epoxy enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

E. Related work: Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under pertinent other Sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. Color selection and samples:
1. Colors will be selected by the Architect from one or more of the specified manufacturers paint lines. Submit samples on rigid cardboard 8-1/2 inches by 11 inches in size with the Architects scheduled colors and glosses applied, for approval before starting work. Sample panels shall be resubmitted to the Architect until final approval is granted. Finished work shall match approved samples;
2. The Architect may select, allocate, and vary colors on different surfaces throughout the Work, subject to the following:
   a. Exterior work: A maximum of four different colors will be used, with variations for trim, doors, miscellaneous work, and metal work;
   b. Interior work: A maximum of eight different pigmented colors will be used, with variations for trim, wall surfaces and wainscots;
   c. Dark tones: A maximum of four dark tones will be used as accent colors for the interior;

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Protection:
   1. Remove or protect during painting, all finish hardware, accessories, fixtures, plates, lighting fixtures, and similar items installed prior to painting and not required to be painted. If removed, carefully replace and adjust on completion of painting;
   2. Furnish and lay drop cloths in all areas where painter's finish work is being done, to protect floors and all other adjacent work and materials from defacement. Remove all temporary protections and coverings from the work and repair or replace finishes;
   3. Any damage resulting from neglect of the above requirements shall be repaired at the Contractor's expense to the complete satisfaction of the Architect.

D. Environmental Conditions:
   1. No exterior painting shall be done in rainy, damp or frosty weather, or until surface is thoroughly dry. No interior painting or finishing shall be permitted until the building has reached a temperature and humidity level recommended by the manufacturer of the paint products being applied;
   2. Maintain temperature of rooms at 70 degrees F or higher where varnish, lacquer or enamel is being applied and at 50 degrees F or higher during other painting and finishing. Exterior painting shall be done only when air temperature is 40 degrees F or higher and only in dry weather;
   3. Apply material under adequate illumination and ventilation;
   4. In the event excessive moisture is present, the General Contractor shall provide the necessary ventilation to establish appropriate conditions. Should the surface be too dry for the product application, the Painting Contractor shall provide the necessary methods to establish the appropriate conditions.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

   1. Quantity: Furnish an additional 10 percent, but not less than 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: All paint materials and their related products specified herein are based on products of first grade and top line manufactured products, of Sherwin-Williams Company. Subject to compliance with requirements, other manufacturers may be submitted for approval.

B. Semi-transparent colored stain for architectural millwork items shall be by Minwax, or alternatives of the quality necessary to meet the specifications, offering a range of colored semi-transparent colored stain selections, and as approved by the Architect.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Correct conditions detrimental to timely and proper completion of the Work prior to proceeding.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Spackle all wall cracks, voids and similar imperfections, in drywall and plaster.

E. Clean all metal free from dust and grease and carefully wire brush to remove all rust or scale. Sand badly rusted spots until metal is clean. Sheet metal, steel and cast wrought iron with priming coat applied, shall be cleaned of debris, and if necessary, the marred surfaces shall be primed before applying the first coat. Clean and lightly sand prefinished metals, such as rooftop mechanical equipment thoroughly before applying the first coat.

F. Galvanized materials shall receive a prime coating of an approved galvanized primer, such as zinc dust. Apply zinc chromate or an equivalent primer as recommended by the paint and aluminum alloy manufacturer to aluminum work, which is specified or noted as being painted.

G. Thoroughly clean, sand, and wipe woodwork to remove all surface dirt.

1. Fill nail holes or similar imperfections smooth with putty after prime coat has become dry and hard. On natural finish wood, the nail hole compound shall be pigmented to match the face veneer.

H. Prepare surfaces of masonry to be painted in strict conformance with the recommendations of the paint manufacturer. Insure that all loose material and material that will dust or dislodge when lightly abraded has been completely removed from masonry surfaces before the application of paint materials.

I. Prepare previously painted and prime coated product surfaces in strict conformance with the recommendations of the Paint Manufacturer. All previously painted surfaces shall be thoroughly cleaned before applying the first coat.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Apply materials with roller or brush, except that spraying will be permitted for items such as mechanical equipment, grilles, or similar items. Mask off adjoining areas not receiving a spray finish against overspray.
2. Paint surfaces behind movable equipment and furniture items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture items with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Allow exterior paints and finishes to dry at least 48 hours between coats. Allow interior paints to dry at least 24 hours between coats. Allow enamels, lacquers and varnishes to dry at least forty-eight hours between coats. Sand lightly between coats with No. 00 sandpaper and dust well before succeeding coat is applied. Allow additional drying time if conditions warrant, to assure that all coats are perfectly dry before applying succeeding coats.

F. Review with the Architect prior to application the surface texture of all painting and finishing. Submit samples, if requested, for approval.

G. All materials throughout shall receive the manufacturer's recommended primer before the finish coats are applied. Touch-up shop applied prime coats, which have been damaged, and touch-up bare areas prior to start of finish coats application.

H. Miscellaneous surfaces and procedures:

1. Exposed mechanical items:
   a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, hangers, and items of similar nature to match adjacent wall and ceiling surfaces, or as directed. (Refer to finish notes on finish schedules and ceiling plans for more information);

b. The painting of mechanical piping and equipment shall include the painting of non-ferrous piping and valve and trap bodies in finished spaces;
c. Paint exterior louvers, dampers, and grilles in colors as selected by the Architect;

2. Exposed electrical items: Paint all exterior electrical items in colors as selected by the Architect;
3. Paint hollow metal and miscellaneous metal installations in unfinished spaces;
4. Paint metal doors in unfinished spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 FINISH

A. Finished surfaces shall be uniform in finish and color and free of brush marks, sagging, corduroy and other imperfections. Should any coat be judged unsatisfactory, sandpaper or otherwise clean off this coat and apply another. If the undercoating is disturbed, complete refinishing will be required. Where necessary for proper coverage, one additional coat shall be applied by the painter without any additional cost to the Owner.

B. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

C. Should workmanship be found defective, proper preparatory work shall be done and additional coats applied as necessary to give finish in accordance with specified requirements.

3.6 PAINTING SCHEDULE

A. The following paint schedule shall generally cover the type of paint required for the project based on Sherwin Williams Company. Other manufactures product lines meeting or exceeding the basis of design products will be considered. Verify finishes with finish schedule and Architect prior to application. Verify first coat in accordance with manufacturer's recommendation for previously painted surfaces.

INTERIOR PAINT SCHEDULE

CMU – Walls -eggshell finish
- Filler: PrepRite Block Filler
- 2 finish coats: ProIndustrial Pre-Catalyzed Water-Based Epoxy, eggshell

Gypsum – Ceilings and soffits- flat finish
- Primer: ProMar Ceiling Paint flat
- Finish coat: ProMar Ceiling Paint flat

Gypsum – Walls – eggshell
- Primer: ProMar 200 Zero VOC Primer
- 2 finish coats: ProIndustrial Pre-Catalyzed Water-Based Epoxy, eggshell

Wood – painted – semi-gloss finish
- Primer: ProMar 200 Zero VOC Primer
- 2 finish coats: Solo Latex semi-gloss

Wood – stained finish
- Stain: Minwax 250
- 2 finish coats: Wood Classics WB Polyurethane A68

Ferrous Metal and Non-Ferrous Metal – Doors, Frames, Stair components and miscellaneous metals
- Including, but is not limited to, elevator frames and doors
- Primer: ProIndustrial Pro-Cryl Universal Primer
- 2 finish coats: ProIndustrial WB Alkyd Urethane Enamel, B53 series, semi-gloss

Exposed Ceiling Structure:
- Primer (Ferrous and Non-Ferrous Metal): ProIndustrial Pro-cryl Universal Primer
- 2 coats: Low VOC Waterborne Acrylic Dryfall, Eggshell B42-W00082

Concrete Floors – Painted
- 2 finish coats: ArmorSeal 8100 WB Epoxy coating

EXTERIOR SCHEDULE

Exterior Ornamental Iron Gate:
- Primer: MacroPoxy 646 Epoxy
- 2 finish coats: Hi Solids Polyurethane, semi-gloss

Ferrous Metal and Non-Ferrous Metal – Doors, Frames, Stair components and miscellaneous metals
- Includes, but is not limited to, elevator frames and doors
- Primer: ProIndustrial Pro-Cryl Universal Primer
- 2 finish coats: ProIndustrial WB Alkyd Urethane Enamel, B53 series, semi-gloss

END OF SECTION 09 9100

SECTION 09 9739 – MINERAL-BASED COATINGS

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Attendance: Architect, Owner, Contractor, Construction Manager, installer, and related trades.
   2. Review: Project conditions, manufacturer requirements, delivery and storage, staging and sequencing, and protection of completed work.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's descriptive data and product attributes.
   2. Samples: 12 x 12 inch coating samples illustrating each coating system, color, and finish. Step back successive coats so that all coats remain exposed.

B. Closeout Submittals:
   1. Maintenance Data.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 2 years' experience in work of this Section.

B. Mockups: 4 x 8 feet of each coating system and color. Approved mockups may remain as part of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Keim, www.keim-usa.com

B. Substitutions: Refer to Division 01.

2.2 MATERIALS

A. Mineral-Based Coatings and Accessories: As scheduled at end of Section.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare scheduled surfaces to receive mineral-based coatings:

   1. Clean surfaces using specified cleaner.

2. Remove paints and coatings from surfaces using specified paint stripper.

3. Ensure that well-bonded acrylic or emulsion paints are sound, clean, and dry. Remove loose and peeling paint and sand areas smooth.

4. Patch cracks, holes, and voids using specified patching compound.

5. Apply specified fixative to surfaces.

B. Apply materials in accordance with manufacturer's instructions.

3.2 APPLICATION

A. Apply mineral-based coatings to scheduled surfaces as indicated in "Mineral-Based Coatings Schedule" below.

B. Apply materials in accordance with manufacturer's instructions.

3.3 MINERAL-BASED COATINGS SCHEDULE

A. New Cast-in-Place Concrete:
   1. Cleaner: HD Cleaner.
   2. Patching compound:
      a. Deep patches: Concrete mortar.
      b. Thinset repairs: Concretal Fine Filler.
   3. Primer: Not required.
   4. Coating: Two coats Concretal Pro Finish.

B. New Concrete Unit Masonry:
   1. Primer: Contact Plus Coarse Primer or Universalputz as contractor option.
   2. Coating: Two coats Concretal Pro Finish.

C. Cement Board Sheathing:
   1. Primer: Contact Plus Coarse Primer or
   2. Coating: Two coats Concretal W High Performance Finish

END OF SECTION 09 9739

SECTION 10 2800 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Toilet accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

C. Warranty: Sample of special warranty.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 TOILET AND SHOWER ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following as identified below and in the drawings:
1. American Specialties, Inc. (Basis of Design)
2. Bobrick Washroom Equipment, Inc.

3. Bradley Corporation.

B. Items furnished by Owner's Vendor:
   1. Toilet Tissue (Roll) Dispenser
   2. Paper Towel (Roll) Dispenser
   3. Liquid-Soap Dispenser
   4. Toilet Tissue (Roll) Dispenser
   5. Trash receptor (portable)

C. Items furnished by Contractor:
   1. Mirror Unit [indicated on Drawings]
   2. Feminine hygiene disposals [indicated on Drawings].
   3. Baby Changing Station [indicated on Drawings]
   4. Coat hooks [indicated on Drawings].
   5. Toilet Tactile Sign [indicated on Drawings]:
      a. Refer to 10 1400 Panel Signage.
   6. Mop and Broom Holder [not indicated on Drawings]:
      a. Basis-of-Design Product: American Specialties, Inc., model #8215-4.
      b. Description: Unit with holders.
      c. Length: 36 inches.
      d. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
      e. Material and Finish: Stainless steel, No. 4 finish (satin).
      f. Quantity: Two.
      g. Location: As directed by Architect.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 2800

SECTION 10 4400 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Portable fire extinguishers
   2. Cabinets
   3. Mounting brackets

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher, cabinets, and mounting brackets.

B. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

C. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. Multi–purpose dry chemical fire extinguishers, 4A:60B:C UL rating:
   1. Larsen's Manufacturing Company, Model "MP10".
   2. Potter Roemer, Model Number 3010.
   3. Or alternative of the quality necessary to meet the specifications.

B. Service, charge, and tag each fire extinguisher not more than five calendar days prior to the Date of Substantial Completion of the Work as that Date is established by the Architect.

2.2 FIRE EXTINGUISHER CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Larsen's Manufacturing Company
   2. Potter Roemer
   3. Or alternatives of the quality necessary to meet the specifications.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

C. Cabinet Construction: Manufacturer's standard box (tub), with trim, frame, door and hardware to suit cabinet type, trim style, and door indicated. Weld joints and grind smooth. Provide additional perimeter reinforcing all sides to not permit bowing, flexing, and to maintain straight true to line form of perimeter. Ease and grind all corners to eliminate any sharp edges.

D. Non-rated cabinet: Larsen's Architectural Series AL-2409-6R with 2-1/2 inches projection trim style, semi-recessed, Vertical Duo Glass door, 1/4 inch clear tempered glass, aluminum mill finish, recessed handle.

E. Fire-rated cabinet: Larsen's Architectural Series FS-AL-2409-R4, "Flame-Shield", with 3-1/2 inches projection trim style, semi-recessed, Vertical Duo Glass door, 1/4 inch clear tempered glass, aluminum mill finish, recessed handle.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Larsen's Manufacturing Company.
   b. Ansul Incorporated; Tyco International Ltd.
   c. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   d. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
   a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers, cabinets and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
1. Fire Extinguisher Cabinets: 54 inches above finished floor to top of cabinet.
2. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

C. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

END OF SECTION 10 4400

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SECTION 12 3661 – NATURAL STONE SILLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Natural stone windowsills

1.3 ACTION SUBMITTALS

A. Product Data: For sill materials.

B. Shop Drawings: For sills. Show materials, finishes, edge profiles, and methods of joining.

   1. Show locations and details of joints.
   2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

   1. Sill material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material sills to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after walls and windows are installed but before sill fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities or any infrastructure that will penetrate sills.

PART 2 - PRODUCTS

2.1 SOLID SURFACE SILL MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide PenArgyl Structural Slate Co. or a comparable product by one of the following:
   b. Natural slate quarry
   2. Colors and Patterns: Black

B. Thickness: 1 inch

C. Finish: Smooth honed finish

D. Edge: eased edge

2.2 SILL FABRICATION

A. Fabricate sills according to published industry standards.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid stone sills with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops with epoxy adhesive.

C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

E. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

END OF SECTION 12 3661.16

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SECTION 12 3661.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertop

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge profiles, and methods of joining.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart Quartz or a comparable product by one of the following:
   a. Dupont
   b. Meganite Inc.
   c. Corian.

2. Colors and Patterns: As indicated on Drawings.

B. Particleboard: ANSI A208.1, Grade M-2.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

C. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.

D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

E. Joints: Fabricate countertops in sections for joining in field. Joint locations shall be submitted with shop drawings for Architect approval.
   1. Joint Type: Sealant filled, 1/16 inch in width.

F. Cutouts and Holes:

   1. Provide grommets in locations as indicated on Drawings.

2.3 INSTALLATION MATERIALS

A. Adhesive and sealant: Product recommended by quartz agglomerate manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 12 3661.19

SECTION 14 24 00 - MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS

PART 1 GENERAL

1.0 RELATED DOCUMENTS

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

1.1 SUMMARY

A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
    1. Standard pre-engineered hydraulic passenger elevators.
    2. Elevator car enclosures, hoistway entrances and signal equipment.
    3. Operation and control systems.
    4. Jack(s).
    5. Accessibility provisions for physically disabled persons.
    6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
    7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
    1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
    2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
    3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
    4. Division 5 Metals:
        a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
        b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
    5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
    6. Division 28 Sections:
        a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
        b. Emergency power supply, transfer switch and auxiliary contacts.
        c. Heat and smoke sensing devices.
        d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.

7. Division 22 Plumbing
    a. Sump pit and oil interceptor.
8. Division 23 Heating, Ventilation and Air Conditioning
    a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
    1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
    2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
    3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
    4. Elevator hoistways shall have barricades, as required.
    5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
    6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
    7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
    8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
    9. All wire and conduit should run remote from the hoistways.
    10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
    11. Install and furnish finished flooring in elevator cab.
    12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
    13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
    14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.

15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.2 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
    1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
    2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
    3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
    4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
    1. Owner's manuals and wiring diagrams.
    2. Parts list, with recommended parts inventory.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
    1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
        a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
    2. The manufacturer shall have a documented, on-going quality assurance program.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
    1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
    2. Building Code: National.
    3. NFPA 70 National Electrical Code.
    4. NFPA 80 Fire Doors and Windows.
    5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
    6. Section 407 in ICC A117.1, when required by local authorities
    7. CAN/CSA C22.1 Canadian Electrical Code
    8. CAN/CSA B44 Safety Code for Elevators and Escalators.
    9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104),

UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:

1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.

1.3 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.6 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.7 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Basis of Design - TK Elevator model ‘Endura’, 3-Stage 4500SP150 Front-Rear, Machine Room-Less hydraulic elevator.

2.2 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in 1.03.9 of this specification.

B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

C. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied powder coat for structural and architectural parts. Color selection must be based on elevator manufacture’s standard selections.

D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

E. Flooring by others.

2.3 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.4 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
    1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
    2. An oil hydraulic pump.
    3. An electric motor.

4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
   5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
   6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
   7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
   8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.5 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
    1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
    2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
    3. Typical door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
    1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
    2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
    3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
    1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate. 7/8” removable panels.
    2. Reveals and frieze: a. Reveals and frieze: Stainless steel, no. 4 brushed finish
    3. Canopy: Cold-rolled steel with hinged exit.
    4. Ceiling: Downlight type, metal pans with suspended LED downlights and dimmer switch. Number of downlights shall be dependent on platform size with a minimum

of six. The metal pans shall be finished with a stainless steel, no. 4 brushed finish.

5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.
7. Handrail: Provide 2' flat metal bar on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.7 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer-based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.

3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.8 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: Not required for this application.

E. Special Equipment: Not Applicable

2.9 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
   1. Access to main control board and CPU
   2. Main controller diagnostics
   3. Main controller fuses
   4. Universal Interface Tool (UIT)
   5. Remote valve adjustment
   6. Electronic motor starter adjustment and diagnostics
   7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
   8. Operation of auxiliary pump/motor (secondary hydraulic power source)
   9. Operation of electrical assisted manual lowering
   10. Provide male plug to supply 110VAC into the controller
   11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: Interface with building-supplied emergency generator standby power source in accordance with building codes.

E. Special Operation: Not Applicable

2.10 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
    1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
        a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at all typical landings.

D. Hall lanterns: A hall lantern with adjustable chime shall be provided at each landing and located adjacent to the entrance. The lanterns, when illuminated, shall indicate the elevator car that shall stop at the landing and in what direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall lantern shall illuminate and the chime shall sound. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor. Illumination of the arrow shall be with LED's. Faceplates shall match the hall station finish. Provide at all typical landings.

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 EXECUTION

3.1 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
    1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
    2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final

adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model: endura MRL Twinpost above-ground 3-stage
   2. Elevator Type: Hydraulic Machine Room-Less, Passenger
   3. Rated Capacity: 4500 lbs.
   4. Rated Speed: 150 ft./min.
   5. Operation System: TAC32H
   6. Travel: 32'-6"
   7. Landings: 6
   8. Openings:
      a. Front: 4
      b. Rear: 2
   9. Clear Car Inside: 5'-8" wide x 7'-10 deep
   10. Inside clear height: 7'-4" standard
   11. Door clear height: 7'-0" standard
   12. Hoistway Entrance Size: 4'-0" wide x 7'-0" high
   13. Door Type: Two-speed | Side opening
   14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
   15. Seismic Requirements: No
   16. Hoistway Dimensions: 7'-8” wide x 10'-9 1/4" deep
   17. Pit Depth: 5'-0"
   18. Button & Fixture Style: Traditional Signal Fixtures
   19. Special Operations: None

3.9 SPECIAL CONDITIONS

A. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish

END OF SECTION

SECTION 22 0010 – GENERAL REQUIREMENTS - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 22.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for plumbing system installations. It is intended to supplement Division 1 sections. Any conflicts shall be brought to the attention of the Architect/Engineer for clarification.

A. Contractor shall also include the following specification sections as part of Division 22 contract requirements:

1. Section 23 0010 – Basic Mechanical Requirements

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 22 0010

SECTION 22 0030 - ELECTRICAL REQUIREMENTS - PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section specifies the basic requirements and responsibilities for motors, motor controls, and electrical work related to equipment furnished under Division 22.

1. The General Contractor has final responsibility for coordination of all work and responsibilities between sub-contractors and installers.

B. Electrical products furnished under Division 22 shall comply with Part 2 – Products below and with applicable Division 26 sections.

C. Refer to the drawings or specifications for the specific electrical requirements (i.e. horsepower, kilowatts, voltage and electrical characteristics) for equipment furnished.

D. Refer to the drawings for automatic control requirements related to wiring and control products.

1.3 REFERENCES

A. NEMA Standards MG 1: Motors and Generators

B. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment

D. NEMA Standard KS 1: Enclosed Switches

E. NFPA 70: National Electrical Code, latest addition or as adopted by the local AHJ.

1.4 SUBMITTALS

A. Submit product data for motors, starters, and other electrical components, as required by the individual equipment specification sections.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
2. Include power, signal, and control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Confirm that voltage and amperage characteristics of equipment to be furnished match those indicated on the electrical drawings. Notify the Architect/Engineer immediately of any discrepancies. Do not proceed furnish equipment which conflicts with the characteristics indicated without approval.

B. Distribute and coordinate the product information which requires electrical coordination with the electrical contractor or sub-contractor.

1. The electrical contractor or sub-contractor shall obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other Divisions. The electrical contractor or sub-contractor shall confirm that voltage and amperage characteristics of equipment to be installed match those indicated on the drawings.

C. Refer to the "Electrical Responsibilities Schedule" if one is included on the drawings for Electrical/Plumbing coordination of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to the compliance with these specifications, the following manufacturers may provide equivalent products to the basis of design; however, in the event that incorporation of an equivalent item into the work requires revisions or additions to other trades, coordinate the installation and bear all costs, at no change in the Contract Sum.

1. Square D Company
2. Siemens
3. Eaton/Cutler-Hammer
4. Allen Bradley
5. Franklin Control Systems

2.2 MOTORS

A. General Motor Requirements:

1. Comply with requirements in this Section except when stricter requirements are specified in plumbing equipment schedules or other Division 22 Sections.
2. Comply with NEMA MG 1 unless otherwise indicated.

B. Polyphase Motors:

1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
2. Motor sizes shall be large enough so that the driven load brake horsepower will not require the motor to operate in the service factor range.

3. Temperature Rating: Rated for 40 degrees C. environment with maximum 50ºC temperature rise for continuous duty at full load (Class A Insulation).
4. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
5. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
6. Efficiency: Premium efficient, as defined in NEMA MG 1.
7. For special motors, more detailed and specific requirements are specified in the individual equipment specifications

C. Motors Used with Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

1. Two-speed motors shall have two separate windings on poly-phase motors.

D. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with, and approved by, VFC manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

E. Single Phase Motors:

1. Motors 1/20 hp and Smaller: Shaded-pole type.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   a. Permanent-split capacitor.
   b. Split phase.
   c. Capacitor start, inductor run.
   d. Capacitor start, capacitor run.
3. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
4. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.3 MOTOR STARTERS

A. General Motor Starter Characteristics:

1. Enclosures: Lockable NEMA 1, general purpose enclosures, except in wet locations shall be NEMA 4 with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.

2. Type and size of starter shall be as recommended by motor manufacturer or the driven equipment manufacturer for applicable protection and start-up condition.

B. Manual Starters, fractional horsepower single phase:

1. Square D Class 2510; Type ‘FG5’ (single pole) or ‘FG6’ (two pole), or equal.
2. Toggle operator, number of poles required by load.
3. NEMA ‘1” enclosure, unless otherwise noted.
4. Green ‘ON’ pilot light in cover.
5. Overload protection: melting alloy type thermal overload relays.
6. Handle guard kit with padlock provision.

C. Magnetic Starter, polyphaser:

1. Square D Class 8536 Form H30 or equal, full-voltage non-reversing unless noted.
2. Full-voltage starter with solid-state “motor-logic” relay with adjustable trip current, to provide overload protection, phase loss and phase imbalance protection.
3. NEMA’1’enclosure, unless indicated or required by application.
4. Hand-Off-Auto selector switch mounted on cover.
5. 24 volt or 120 volt control transformer, fused from line side.
6. Externally operated manual reset.
7. Green ‘on’ pilot light in cover.
8. N.O and N.C. auxiliary contacts.

2.4 SMART STARTERS

A. General: “Smart Starter” combination motor starters include integrated control logic, wiring terminals, electronic overload protection, internal disconnect means, and other features as specified below.

1. Manufacturer shall provide a five year warranty on the complete starter assembly.
2. The starter assembly shall be UL listed under UL 508A.

B. Single Phase Combination Starter; Franklin Control Systems BAS-1P or equal.

1. Ratings: 110 volt or 208/240 VAC single phase motors from 0.1 HP to 1.0 HP.
2. Manually-operated quick-make toggle mechanism lockable in the “off” position to function as the motor disconnect.
3. Electronic adjustable overload protection with manual reset.
4. LED pilot lights for ‘run’ and ‘fault’ status.
5. Hand-Off-Auto switch, concealed behind cover.
6. Controls: provide an interposing run relay and current sensing status output relay.
    a. Wiring terminals allow for remote control run (ON/OFF) input.
    b. Wiring terminals available for run status output and fault output.
    c. All control terminals shall be integrated in the starter.
7. Provide surface mount enclosure for mounting to a single-gang box.

2.5 DISCONNECT SWITCHES

A. General: Furnish disconnect “safety” switches in types, sizes, duties, features, ratings, and enclosures as required or indicated.

1. NEMA 1 enclosure for indoor switches.
2. NEMA 4 enclosure with raintight hub, for outdoor switches.
3. For motor disconnects, provide units with horsepower ratings suitable for the loads served.

B. Non-fusible switch: Heavy duty switches, voltage classes and current ratings as required or indicated; Square “D” Class 3110 or equal.

1. Single throw externally-operable handle, quick-make/quick-break mechanism, interlocked hinged cover, equipment grounding kit.
2. Provide number and arrangement of auxiliary interlock contacts in switches when indicated.

C. Fusible switch: Heavy duty switches, voltage classes and current ratings as required or indicated; Square “D” Class 3110 or equal.

1. Single throw externally-operable handle, quick-make/quick-break mechanism, interlocked hinged cover, equipment grounding kit, fuse holder clips with Class H fuses (unless indicated), and current ratings indicated.
2. Provide number and arrangement of auxiliary interlock contacts in switches when indicated.

D. Toggle disconnect switch (for fractional horsepower motors with internal overload protection, maximum 1 HP/16 FLA); Hubbell HBL1221B (brown).

1. Single or double-pole industrial grade toggle switch, non-fused, nylon handle, one-piece bridge.
2. 20 amps, 120/208/240/277 volts.
3. Single-gang box with galvanized cover plate and integral guard with padlock provision.

E. In-line plug-type motor disconnects may be furnished for fractional horsepower motor disconnects where specified as part of equipment.

2.6 COMBINATION MAGNETIC MOTOR STARTER/DISCONNECT

A. Provide device with same features as magnetic motor starters and disconnect switches as specified above, in common enclosure.

1. Square D Class 8536 Form H30 or equal, full-voltage non-reversing unless noted.
2. Full-voltage starter with solid-state “motor-logic” relay with adjustable trip current, to provide overload protection, phase loss and phase imbalance protection.
3. Single throw externally-operable handle, quick-make/quick-break mechanism, interlocked hinged cover, equipment grounding kit.
4. NEMA’1’enclosure, unless indicated or required by application.
5. Hand-Off-Auto selector switch mounted on cover.
6. 24 volt or 120 volt control transformer, fused from line side.

7. Externally operated manual reset.
8. Green ‘on’ pilot light in cover.
9. N.O and N.C. auxiliary contacts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate installation with electrical installer. Provide copies of approved shop drawings for equipment to be wired.

B. Follow manufacturer’s installation instructions.

3.2 ELECTRICAL CONNECTIONS

A. All electrical power connections to equipment will be made by the electrical contractor or sub-contractor (EC), through the remote starter and/or remote disconnect where indicated.

B. Motors and motor controls for equipment shall be furnished and set by the plumbing contractor or sub-contractor (PC) as work of Division 22. Field-installed disconnects, starters, transformers, etc. shall be furnished by the PC and installed and wired by the EC.

C. The contractor or sub-contractor furnishing the motorized equipment shall coordinate and supervise start up and testing of equipment.

3.3 ELECTRICAL RESPONSIBILITY AND COORDINATION

A. The PC shall check each piece of equipment or motor for alignment, lubrication, etc. The electrical contractor will test each motor for proper rotation after final connections are completed and before applying current to the motor. The EC will make any necessary adjustments to the starter and control equipment for proper starting and overload protection.

B. The plumbing contractor or sub-contractor (PC) shall furnish all plumbing equipment, pump motors, starters, push buttons for local and remote control, controllers, pressure switches, aquastats or similar items together with all appurtenances, accessories and control wiring required to operate the equipment furnished under the Division 22 sections of the contract, and as necessary to perform the operating functions as specified, shown on the drawings or as otherwise required.

C. The PC shall set and mount all plumbing equipment, motors, starters, variable frequency controllers, and control panels and devices. The electrical contractor or sub-contractor (EC) will, unless noted otherwise, furnish and install all safety switches at the equipment and make all power wiring connections (120 volts and above) to equipment or motors through the safety disconnect switch, remote motor starter, or line voltage control device (thermostat, aquastat, etc.). Where the starter and/or safety switch is an integral part of the equipment assembly, the assembly shall be furnished with the wiring being complete between the starter, controller and motor and the EC will make the power connections only at the unit.

D. If procurement requirements necessitate a change in the electrical characteristics of any motor or equipment being furnished under Division 22, the PC shall first obtain approval of such changes from the Engineer. The PC shall also be responsible for all necessary arrangements and shall pay all costs, if any, for all required changes to the electrical work.

E. The EC will furnish, install and connect all power wiring to designated control panel locations. The PC shall furnish, install and connect all low voltage (24 volts) control wiring to all equipment controls and appurtenances provided under Division 22, unless otherwise specified herein or indicated on the drawings.

F. Refer to the Electrical Responsibility Schedule on the drawings for additional information on responsibilities for providing starters, disconnects and controls.

G. The EC shall be responsible for proper rotation of three phase equipment.

END OF SECTION 22 0030

SECTION 22 0050 - BASIC MATERIALS AND METHODS - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 22.

1.2 SUMMARY

A. This Section includes limited scope general construction materials and methods for application with plumbing installations as follows:

1. Piping materials and construction
2. Miscellaneous metals
3. Painting and finishing
4. Sleeves and seals
    a. Sleeves
    b. Escutcheons
5. Joint sealers
6. Fire stop systems
7. Anchor bolts
8. Concrete and masonry work
9. Earthwork

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Product Data: For all specified materials and products.

B. Shop Drawings: Detail fabrication and installation for supports and anchorage for materials and equipment.

C. Firestop: For each firestop system show construction conditions, relationships to adjoining construction, dimensions, description of materials and finishes, component connections, anchorage methods, hardware and installation procedures, plus the following:

1. Firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that confirms compliance with requirements for each condition.
2. Refer to Division 7, Thermal and Moisture Protection, for additional requirements related to Firestop Systems.

1.5 QUALITY ASSURANCE

A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.6 PROJECT CONDITIONS

A. Maintain and protect existing building services, which transit the area affected by selective demolition. Provide temporary utility services to affected areas.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, undermining, washout, and other hazards created by excavation operations.

C. Existing Utilities: Locate any existing underground utilities near excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.

D. Remove existing underground utilities indicated to be removed.

1. Uncharted or Incorrectly Charted Utilities: Contact utility owner immediately for instructions.
2. Provide minimum of 48-hour notice to owner and/or Architect/Engineer prior to utility interruption.

E. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joints sealer manufacturer. Do not apply joint sealers to wet substrates.

F. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 sections for pipe and fitting materials and joining method requirements.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

D. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

E. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

F. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

1. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
2. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107; CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Non-pressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant stainless steel band on each end.

1. Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Fernco, Inc.
   c. Mission Rubber Company.
   d. Plastic Oddities, Inc.
   e. Or approved equal.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials. Insulating material suitable for system fluid, pressure, and temperature

B. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:
   a. Eclipse, Inc.
   b. Epco Sales, Inc.
   c. Hart Industries, International, Inc.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Industries, Inc.; Wilkins Div.
   f. Or approved equal

C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:
   a. Central Plastics Company.
   b. Epco Sales, Inc.
   c. Watts Industries, Inc.; Water Products Div.
   d. Or approved equal

D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Or approved equal

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
a. Calpico, Inc.
b. Lochinvar Corp.
c. Precision Plumbing Products, Inc
d. Or approved equal

F. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Or approved equal

2.5 MISCELLANEOUS METALS AND LUMBER

A. Miscellaneous metal shall be as follows:

1. Steel plates, shapes, bars, and bar grating: ASTM A 36.
2. Cold-Formed Steel Tubing: ASTM A 500.
3. Hot-Rolled Steel Tubing: ASTM A 501.
4. Steel Pipe: ASTM A 53, Schedule 40, welded.
5. Fasteners: Zinc-coated, type, grade, and class as required.

B. Miscellaneous lumber shall be as follows:

1. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
2. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.

2.6 ACCESS DOORS AND PANELS

A. Refer to Division 8 Sections for material requirements related to Access Doors and Panels.

2.7 PAINTING

A. Refer to Division 9, Painting, for material requirements related to Painting and Finishing

2.8 SLEEVES

A. Provide sleeves where required to protect pipe penetrations. Each sleeve shall extend through its respective foundation, floor, or wall and shall be cut flush with each surface unless otherwise required.

1. Sleeve diameter shall allow for installation of specified sealant or seals.
2. All sleeves shall be coordinated with general construction work and secured in place

B. Sleeves through floor slabs or exterior aboveground masonry walls: ASTM A53, Type E, Grade B, Schedule 40, galvanized steel pipe finished with smooth ends.

C. Sleeves through below grade foundations: Cast iron or ductile-iron pipe finished with smooth ends.

D. Sleeves through exterior below grade 'basement' or tunnel walls: Mechanical sleeve seal as specified below.

E. Sleeves through interior walls, partitions or suspended ceilings: Galvanized-steel sheet, 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Floor sleeves shall extend 1 inch above the finished floor. Sleeve shall provide 1/2" space between floor sleeves and passing conduit and shall be caulked with waterproof sealant or fire sealant where required.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, to fill annular space between pipe and sleeve, designed for field assembly to create a waterproof seal at the pipe penetration.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Thunderline.
   e. Or approved equal
2. Sealing Elements: interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10 JOINT SEALERS

A. Refer to Division 7 Sections for material requirements related to Joint Sealants.

B. Joint fillers and other related materials compatible with each other and with joint substrates under conditions of service and application. Colors shall be as selected by the Architect from manufacturer's standard colors.

2.11 FIRESTOP SYSTEMS

A. Refer to Division 7, Thermal and Moisture Protection, for material requirements related to Firestop Systems

2.12 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe and an outside diameter that completely covers the annular space around the pipe.

B. One-Piece, Cast-Brass Type: Polished chrome-plated with set screw.

C. Split-Casting, Cast-Brass Type: Polished chrome-plated with concealed hinge and set screw.

D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

2.13 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Premixed and factory packaged, post-hardening, volume-adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 3000-psi, 28-day compressive strength.

2.14 CONCRETE

A. Refer to Division 3 Concrete for materials requirements related to Concrete work.

2.15 ANCHOR BOLTS

A. Provide and set in place at the time equipment bases are poured, all necessary anchor bolts as required for the equipment specified. Anchor bolts shall be L-hook type and of the proper sizes and length to suit the apparatus.

2.16 EARTHWORK

A. Refer to Division 31, Earth Work, for materials requirements related to Earth Work.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - GENERAL REQUIREMENTS

A. Install piping according to the following requirements and Division 22 sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Piping Installation:

1. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
2. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
3. Install piping to permit valve servicing.
4. Install piping at indicated slopes. Install piping free of sags and bends.
5. Install fittings for changes in direction and branch connections.
6. Select system components with pressure rating equal to or greater than system operating pressure.
7. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
    a. New Piping:
        1) Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
        2) Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
        3) Insulated Piping: One-piece, stamped-steel type with spring clips.
        4) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
        5) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
        6) Bare Piping at Ceiling Penetrations in Finished Spaces:
        7) Bare Piping at Ceiling Penetrations in Finished Spaces:
        8) Bare Piping in Unfinished Service Spaces:

D. Pipe Sleeves:

1. Sleeves are not required for core-drilled holes. Permanent sleeves are not required for holes formed by removable temporary sleeves.
2. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and slabs.
3. Install sleeves for pipes passing through fire-rated concrete and masonry walls, gypsum-board partitions, and concrete floor slabs.
4. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-

iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

5. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   a. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      1) Steel Pipe Sleeves: For pipes smaller than NPS 6.
      2) Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
      3) Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
   b. Seal space outside of sleeve fittings with grout.
   c. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
6. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and watertight sealant materials. Select sleeve size to allow for 1/4-inch annular clear space between pipe, or pipe insulation where pipe is specified to be insulated, and sleeve for installing sealant.
   a. Install steel pipe for sleeves smaller than 6 inches in diameter.
   b. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
7. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   a. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
   b. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07.
   c. Patch and/or seal all openings or penetrations made in fire rated floors, ceilings or partitions after work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material. All fire sealant material shall be U.L. classified and approved by the Architect/Engineer.
   d. Verify final equipment locations for roughing-in.
   e. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Non-pressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

J. Piping Gasketed Joints: Join according to ASTM D 3212.

K. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.

2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.3 EQUIPMENT INSTALLATION – GENERAL REQUIREMENTS

A. Install equipment and piping to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope

3.4 EARTHWORK

A. Provide all labor, equipment and services required for underground or underslab piping system excavation and backfill. Coordinate underground work with the work of other trades.

B. Refer to Division 31, Earthwork, for requirements related to Earthwork.

3.5 ERECTION OF SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

C. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

D. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

E. Attach to substrates as required to support applied loads.

3.6 ANCHORS

A. Direct all pipe motion to expansion joints by heavy clamps and/or structural steel sections clamped or welded to structural members as required and/or as shown on drawings. Points at which anchors are located and secured shall be approved by the Engineer so that no structural members shall be unduly strained. Where possible, anchor points shall be on members running parallel to the piping being anchored.

3.7 CONCRETE WORK

A. Refer to Division 3 Concrete for installation requirements related to concrete work.

B. Provide all labor, equipment and services required for indoor and/or outdoor concrete work related to piping installations in conformance with ACI (American Concrete Institute) guidelines and practices.

3.8 CONCRETE BASES AND ANCHOR BOLTS

A. General: Provide and set in place at the time the equipment pads or bases are poured, all anchor bolts required for the equipment specified. Anchor bolts shall be of the type and proper sizes and length to suit the application and concrete thickness.

B. Concrete Bases, Indoors: Anchor equipment to new or existing concrete base or substrate as indicated, according to equipment manufacturer's written instructions.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.
2. New Concrete Base: Pour new base integral with new floor slab, or else roughen existing concrete surface and install vertical rebars dowels on 18-inch centers around the full perimeter of the base, unless otherwise indicated, to anchor new concrete base to new or existing concrete floor. Use L-hook type anchor bolts imbedded the full slab depth.
3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment

3.9 ERECTION OF SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Field Welding: Comply with AWS D1.1.

C. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor materials and equipment.

D. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

E. Attach to substrates as required to support applied loads.

F. Direct all conduit or equipment motion to expansion joints by heavy clamps and/or structural steel sections clamped or welded to structural members as required and/or as indicated. Points at which anchors are located and secured shall be approved by the Architect/Engineer such that no structural members shall be unduly strained. Where possible, anchor points shall be on members running parallel to the piping being anchored.

3.10 JOINT SEALER APPLICATION

A. Refer to Division 7, Thermal and Moisture Protection, for installation requirements related to Firestop Systems.

3.11 FIRESTOP SYSTEMS

A. Refer to Division 7, Thermal and Moisture Protection, for installation requirements related to Firestop Systems.

3.12 PAINTING AND FINISHING

A. Painting of systems, equipment, and components is specified in Division 09 Painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION 22 0050

SECTION 22 0090 - REMOVALS AND DEMOLITION - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes requirements for complete or partial demolition and removal of plumbing systems.

B. The Drawings generally indicate the demolition required to accommodate the new construction but are not all inclusive. The full extent of demolition work must be determined in the field based on the actual conditions encountered and as required for the satisfactory provision and proper execution of the work. It is the responsibility of the Contractor to coordinate the scope of work for each trade or subcontractor.

1.3 DESCRIPTION OF WORK

A. Contractor shall be responsible for the removal of existing piping, fixtures, insulation, supports, and equipment in the existing building which is noted or shown on the Drawings or which is in conflict with the new construction or new plumbing systems.

1. Remove all associated appurtenances such as hangers, insulation, sleeves, supports, roof curbs, and concrete pads.
2. Remove all associated controls including pneumatic tubing and control wiring back to its source.
3. Existing piping which is to be partially demolished shall be removed and shall be disconnected at the source and capped.
4. Furnish all labor, equipment hauling, rigging, scaffolding, etc. necessary for the demolition work required for the project.

B. Cut and cap ends of existing piping systems which must remain active throughout phases of construction and where portions of the existing systems are shown on the Drawings to remain in service. Remove existing piping as indicated on the plans to the point of reconnection.

C. Where existing piping or equipment must be removed to install new systems but the materials must also remain operational because of phasing, the Contractor shall provide temporary piping for the remainder of the construction phasing.

1.4 SHUT-DOWNS

A. Existing piping, fixtures, equipment, ductwork and related accessories which require systems to be shut-down shall be coordinated with the Owner. Periods of shut-down shall be minimal and all new work shall be planned and scheduled to reduce service interruptions to the building.

B. All construction and demolition work shall be performed in a manner as to keep the existing systems in operation as the work progresses. Prior to commencing construction, the Contractor shall develop a construction schedule for approval of the Owner and Architect.

1.5 OWNERSHIP

A. The Owner shall have the option of keeping any salvageable equipment, fixtures, or specialty items indicated for removal. Any items that Owner does not identify for salvage shall become the property of the Contractor and shall be legally disposed of. Prior to removing any materials or equipment, the Contractor shall review with the Owner and identify salvage materials or equipment. The Contractor shall proceed to remove claimed equipment with extreme care so as not to damage the equipment or material and place it at a designated location on the site.

B. Provide notarized certification that disposal of materials resulting from demolition operations has been accomplished in conformance with all pertinent requirements and regulations of governmental agencies having jurisdiction.

PART 2 - PRODUCTS: (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Architectural ('A'), Plumbing ('P'), HVAC ('H'), and Electrical ('E') drawings for additional information pertinent to demolition and removal required.

1. Refer to Phasing Plans when provided for phasing and sequencing requirements.

B. Shutoff existing systems, drain piping, and verify conditions are suitable to proceed with demolition work,

C. Materials resulting from demolition and removal operations shall become the property of the Contractor and shall be completely removed from the site unless noted otherwise on the drawings or requested by the Owner.

D. Storage of debris and other materials resulting from demolition operations shall not be permitted to be stored on site, unless noted otherwise.

E. When an existing item is removed, the Contractor shall also remove the accompanying sealant, supports, and all anchors. All sealant residues shall be completely removed and the walls cleaned and repaired to match adjacent wall surfaces.

F. All obsolete items not required or needed in the renovated areas (i.e., piping, hangers, vent penetrations, equipment, controls, etc.) shall be removed and the remaining surfaces patched to match the adjacent existing and/or new finishes.

G. Contractor shall protect all finished floors, walls, ceilings, and furnishings throughout the demolition area. Any damage to the area as a result of demolition shall be repaired to match existing conditions at no cost to the Owner.

3.2 CUTTING AND PATCHING

A. Cut existing wall, roof, and floor surfaces to allow demolition of equipment and piping. Patch existing materials and using similar materials and methods of construction. Patch floors, walls and roofs in a manner to maintain structural integrity and to the satisfaction of the Architect.

B. Where equipment or piping is removed, and holes or marked surfaces are left finished surfaces, they shall be patched to match the existing surface. If painting work is not required by the architectural drawings or specifications, then the entire wall or ceiling shall be painted to match the original color.

C. Sawcutting of existing floors and excavation to access under-slab or in-slab piping shall be performed by the Contractor.

1. Locations of existing under-slab piping and conduit, where shown on the drawings, are assumed locations and are based on the original design drawings and/or visual observations. The Contractor shall allow for deviations in actual pipe locations.
2. Other under-slab utilities, including storm, sanitary, water, and electrical conduits may also be existing. The Contractor shall perform scanning or other means necessary to identify any existing materials prior to beginning work. Contractor is responsible for any damage caused by sawcutting and/or excavation.
3. Excavation shall be performed in a cautious manner to avoid damaging the building or existing under-slab piping and conduit. Backfill and compaction of the excavated area and re-pouring of the concrete floor shall be performed by the contractor. The finished floor surface match existing and be satisfactory to accept new floor surfaces.

D. Remove, store, and reinstall ceiling tiles if required for access to piping and equipment in the ceiling plenum space. Tile removal and replacement shall be done without damage to the ceiling materials. The Contractor is responsible for any damage to the ceiling materials. Tiles or grid damaged by the Contractor shall be replaced with new materials to match existing. The Contractor shall document areas of the ceiling removal work prior to start of such work to document any pre-existing conditions.

E. Where building steel is protected by spray-on fireproofing material, patch and repair any fireproofing damaged or removed by demolition activities.

END OF SECTION 22 0090

SECTION 22 0523 – PLUMBING VALVES AND SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes Valves for domestic water distribution piping:

1. Bronze ball valves.
2. Butterfly valves.
3. Check valves.
4. Balancing valves

B. Section includes Specialties for domestic water distribution systems:

1. Backflow preventers
2. Thermostatic mixing control valves
3. Strainers
4. Water hammer arrestors
5. Hydrants and hose bibbs
6. Fixture supply valves
7. Thermometers.
8. Gages.

C. Related Sections:

1. Other Division 22 Sections for specialty valves applicable to those Sections.
2. Division 22 Section "Identification for Plumbing Systems" for valve tags and schedules.

1.3 DEFINITIONS

A. Abbreviations:

1. CWP: Cold working pressure.
2. EPDM: Ethylene propylene copolymer rubber.
3. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
4. NRS: Non-rising stem.
5. OS&Y: Outside screw and yoke.
6. RS: Rising stem.
7. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve, including details of construction and certifications.

B. Maintenance data and parts list, for inclusion in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves and Specialties: Obtain each type of valve and specialty from a single manufacturer.

B. Compliance:

1. NSF 61, valve materials used for potable-water service.
2. ASTM listed lead-free silicon bronze valves shall be made with corrosion-resistant materials.
3. EN ISO 6509 regarding dezincification corrosion resistance and stress corrosion cracking.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage and handling:

1. Maintain valve and specialty end protection.
2. Store products indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store products off the ground in watertight enclosures.
3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to drawings and valve schedule articles for size, type, and applications of valves.

1. Valve Pressure and Temperature Ratings: Not less than indicated or as required for system pressures and temperatures.
2. Valve Sizes: Same as upstream piping unless otherwise indicated.

B. Valve Actuator Types:

1. Hand Lever: For quarter-turn valves.
2. Hand wheel: For valves other than quarter-turn types.

C. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

D. Valve Bypass and Drain Connections: MSS SP-45.

E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Milwaukee Valve Company
2. Nibco, Inc.
3. Stockham
4. Victaulic Company
5. Or approved equal

2.2 BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves

1. Description:
   a. Standard: MSS SP-110/145
   b. Ratings: 150 psig SWP / 600 psig CWP
   c. Body Design: Two piece, full port, blowout-proof stem, 3/4" to 3" sizes
   d. Materials: Bronze body, NSF 61 UL-compliant, certified as "No-lead", bronze stem, threaded ends, PTFE/TFE seats, chrome-plated brass or stainless steel ball, extended handle neck for 1" insulation.
2. Basis-of-design products: NIBCO Model T/PC-585-66-LF (-NS) with copper x male adapters or press x male adapters.

2.3 BUTTERFLY VALVES

A. Cast Bronze Body Butterfly Valves

1. Description:
   a. Rating: 300 psig CWP.
   b. Body: ASTM B 584, cast bronze, grooved ends, copper-tubing sized, extended handle neck for 2" insulation.
   c. Disc Coating: EPDM. Coating shall be UL classified NSF-61 for potable water service
   d. Stem: Integrally cast with disc.
   e. Sizes: 3" through 6", lever handle
2. Basis-of-design products: Victaulic Series 608 or NIBCO Model GD-4765N-3/5.

B. Ductile Iron Lug Body Butterfly Valves

1. Description:
   a. Rating.; 300 psig CWP
   b. Body: ASTM A 536, ductile iron grooved or lug type; suitable for bidirectional dead-end service at rated pressure. Body to have 2" extended handle neck for 2" insulation.
   c. Seat: EPDM (field replaceable and rated for 250 F), pressure-responsive, certified as NSF-61 for potable water service
   d. Stem: two-piece stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating.
   e. Disc: Aluminum bronze or stainless steel.

f. Operator: Sizes 3” to 6” shall be lever operated with ten position throttling plate.

2. Basis-of-design products: NIBCO Model LD-2000N-3/5, Victaulic Style No. Vic300

2.4 CHECK VALVES

A. Bronze Lift Check Valves

1. Description:
   a. Design: Class 125 vertical flow, threaded ends, 200 psig CWP Rating, NSF 61 Compliant.
   b. Body Material: ASTM B 61 or ASTM B 62, bronze,; 3/4” to 2”
   c. Disc: Buna-N NBR, PTFE, or TFE.
2. Basis-of-design product: NIBCO Model T-480-Y-LF with copper x male adapters

B. Bronze Swing Check Valves

1. Description:
   a. Design: Class 125, T-pattern, 200 psig CWP Rating, NSF 61 Compliant.
   b. Body Material: ASTM B 62, bronze, threaded or soldered ends, 3/4” to 2”
   c. Disc: NBR, PTFE, or TFE
2. Basis-of-design products: Milwaukee Valve 509 or 1509, NIBCO Model T-413-Y-LF with copper x male adapters, Stockham B-316Y

C. Iron Body Swing Check Valves

1. Description:
   a. Standard: Class 125 MSS SP-71, Type I, 200 psig CWP Rating., NSF 61 Compliant.
   b. Body Design: Clear or full waterway, flanged ends.
   c. Body Material: ASTM A 126, gray iron with bolted bonnet, brass or bronze trim.
   d. Gasket: Asbestos free.
2. Basis-of-design products: Milwaukee Valve F2974M, NIBCO Model F918-B, Stockham G931

D. Ductile Iron Grooved-End Swing Check Valves:

1. Description:
   a. 300 psig CWP Rating, suitable for vertical or horizontal installation.
   b. Body Material: ASTM A 536, ductile iron, NSF 61 Compliant.
   c. Seal: EPDM.
   d. Disc: Spring-operated, ductile iron or stainless steel.
2. Basis-of-design product: Victaulic Company Series 716.

E. Class 125, Iron, Globe, Center-Guided Check Valves

1. Description:
   a. Standard: MSS SP-125, 200 psig CWP Rating:
   b. Body: ASTM A 126, gray iron, globe style, spring loaded.

c. Flanged ends, bronze seat.
2. Basis-of-design products: Milwaukee Valve 1800 Series, NIBCO Model F/W-910-B-LF

2.5 OS&Y GATE VALVES - IRON

A. Class 125, OS&Y, Iron Gate Valves:

1. Description:
a. Standard: MSS SP-70, Type I, 200 psig CWP Rating.
b. Body Material: ASTM A 126, gray iron with bolted bonnet.
c. Flanged ends, bronze trim.
d. Solid wedge disc, asbestos free packing and gasket.
2. Basis-of-design products: Milwaukee Valve F-2885A, Nibco F-639-33, Stockham G-623

2.6 BALANCING VALVES

A. Automatic Thermal Balancing Valve.

1. Brass valve, stainless steel and copper adjustable thermostatic cartridge, EPDM hydraulic seals, 302 stainless steel springs, ABS adjustment knob with temperature adjustment scale and tamper-proof adjustment locking screw, and temperature gauge/probe dry-well port. Internal thermostatic balancing cartridge automatically modulates flow in domestic hot water recirculation circuits to ensure constant temperature, adjustable from 95F to 140F.
a. Provide with check valve and pre-formed insulation shell.
b. Provide with outlet temperature gauge, 30F to 180F scale, 1½ inch diameter.
c. NPT female connections.
d. Maximum working pressure: 230 psi. Maximum differential pressure: 15 psi.
e. Maximum inlet temperature: 195F.
f. Flow rating: 2.1 Cv maximum, 0.23 Cv minimum, 0.52 Cv design.
g. ANSI/NSF 372-2011 certified as low-lead and listed by ICC-ES, file PMG-1360.
2. Manufacturers:
a. Caleffi series 1162, for domestic hot water recirculation circuits with thermostatic by-pass cartridge for 160F-170F thermal disinfection function.
b. ThermOmegaTech Circuit Solver
c. Or approved equal

2.7 BACKFLOW PREVENTERS

A. Manufacturers:

1. Ames Co., Inc.
2. Conbraco Industries, Inc.
3. Watts Industries, Inc.; Water Products Div.
4. Zurn Industries, Inc.; Wilkins Div.

B. General: ASSE standard, backflow preventers.

1. NPS 2 and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
    a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.
3. Interior Components: Corrosion-resistant materials.
4. Strainer: On inlet, if indicated.

C. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

D. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.

F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves. (Watts Series 909 basis-of-design)

1. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.

G. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves. (Watts Series 007 & 709 basis-of-design).

1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

H. Anti-siphon pressure-type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

I. Dual-check valve Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, NPS 3/8.

J. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves; and bypass with displacement-type water

meter, valves, and reduced-pressure backflow preventer (Watts Series 909RPDA basis-of-design).

1. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.

K. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer (Watts Series 770 DCDA basis-of-design).

1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

L. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head of water back pressure. Include two check valves; intermediate atmospheric vent; and non-removable, ASME B1.20.7, garden-hose threads on outlet (Watts Series 8 basis-of-design).

2.8 STRAINERS

A. Strainers: Y or T pattern and full size of connecting piping. Include ASTM A666, Type 304 stainless-steel screens with 3/64-inch round perforations.

1. Pressure Rating: 125-psig minimum steam working pressure.
2. NPS 2 and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown and hose-end drain valve.
5. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket.
6. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.
   a. Type: Simplex with one basket.
   b. Drain: Factory- or field-installed, hose-end drain valve.

2.9 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, potable-supply-fed type, The device shall provide intermittent discharge to the connected trap in response to the flow or pressure drop changes in the supply line:

1. 125-psig minimum working pressure.
2. Bronze body with atmospheric-vented drain chamber.
3. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
4. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
6. Manufacturers:
   a. Basis-of-Design: Jay R. Smith 2694 Series
   b. Watts Industries, Inc.
   c. Zurn Industries, Inc.

d. Or approved equal.

B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type. Trap primer tailpiece shall be a gravity fed device with no mechanical parts. Chrome-plated, lavatory cast-brass P-trap, NPS 1-1/4 minimum, with NPS 1/2 trap makeup connection.

1. Basis-of-Design: Sioux Chief 200/213/206 series
2. Watts Industries, Inc.
3. Zurn Industries, Inc.
4. Or approved equaol

2.10 MISCELLANEOUS PIPING SPECIALTIES

A. General: Refer to drawings and schedules for size, type, and applications of water piping specialties.

1. Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
2. Sizes: Same as upstream piping unless otherwise indicated

B. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes based on ASSE 1010 or PDI-WH 201, Sizes A through F.

1. Manufacturers:
   a. Josam Co.
   b. Smith, Jay R. Mfg. Co.
   c. Tyler Pipe; Wade Div.
   d. Zurn Industries, Inc.

C. Fixture Supply Valves: Supply kits shall include chrome plated brass stops with full turn brass stem (no plastic), chrome plated copper risers and shallow bell brass flange. Inlet shall be 1/2 inch, outlet shall be 3/8 inch. Supply kit shall be certified by CSA or other recognized testing authority and bear manufacturer and testing mark. Stop to be certified to 200 psi line pressure.

D. P-Traps: P-Traps shall be chrome plated cast brass body with cleanout, with 17 gauge seamless tubular wall bend, cast brass slip nuts. (No reducing washers), with shallow bell brass flange. P-Traps shall be equivalent to McGuire Premier Line. Traps shall be certified by CSA or other recognized testing authority and shall bear manufacturer and testing mark.

E. Sink Insulation Kits: Seamless Pre-wrapped all cast brass ground joint swivel P-Trap kit furnished with McGuire cast brass ground joint swivel P-trap with cleanout, seamless supply riser tube covers, supply angle stop covers and angle stop wheel handle covers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling. Examine threads on valve and mating pipe for form and cleanliness. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage

B. Grooved ends shall be clean and free from indentations and projections in the area from valve end to groove.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

1. Locate valves for easy access and provide separate support where necessary.
2. Install valves in horizontal piping with stem at or above center of pipe.
3. Install valves in position to allow full stem movement.
4. Install chain wheels on operators for valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

B. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves. Use OS&Y only where indicated on the plans.
2. Butterfly Valve Dead-End Service: Single-flange (lug) or grooved type.
3. Balancing valves: Thermal activated.
4. Pump-Discharge Check Valves:
    a. NPS 2 and Smaller: Bronze swing check valves.
    b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided.
    c. Center Lift Check Valves with Bronze Disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

3.5 DOMESTIC HOT AND COLD WATER VALVE SCHEDULE

A. Pipe NPS 3 and Smaller:

1. Bronze Valves: May be provided with solder-joint or threaded ends.

B. Pipe NPS 4 and Larger:

1. Iron Valves, Grooved or flanged ends.

3.6 THERMOMETER AND PRESSURE GAGE APPLICATIONS

A. Install liquid-in-glass direct-mounting thermometers in the outlet of each domestic water heater or hot-water storage tank, and elsewhere as indicated.

B. Install pressure gages at water service entrance, discharge of each pressure-reducing valve, suction and discharge of each plumbing pump, and elsewhere as indicated.

C. Install thermometers and adjust vertical and tilted positions. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated

D. Install pressure gages in piping tees with pressure gage located on pipe at most readable position. Install needle-valve and snubber fitting in piping for each pressure gage.

E. Install thermometers and gages adjacent to equipment to allow service and maintenance for thermometers, gages, machines, and equipment. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 22 0523

SECTION 22 0529 - PLUMBING HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-suppression piping.
3. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Pipe positioning systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. National Pipe Hanger Corporation.
2. AAA Technology & Specialties Co., Inc.
3. Bergen-Power Pipe Supports.
4. B-Line Systems, Inc.; a division of Cooper Industries.
5. Carpenter & Paterson, Inc.
6. Empire Industries, Inc.
7. ERICO/Michigan Hanger Co.
8. Globe Pipe Hanger Products, Inc.
9. Grinnell Corp.
10. GS Metals Corp.
11. MIRO Industries
12. PHD Manufacturing, Inc.
13. PHS Industries, Inc.
14. Pipe Shields, Inc.
15. Rilco Manufacturing Company, Inc.
16. Piping Technology & Products, Inc.
17. Tolco Inc.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped. All metal to be galvanized.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Coatings: Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
    a. Hilti, Inc.
    b. ITW Ramset/Red Head.
    c. Masterset Fastening Systems, Inc.
    d. MKT Fastening, LLC.
    e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
    a. B-Line Systems, Inc.; a division of Cooper Industries.
    b. Empire Industries, Inc.
    c. Hilti, Inc.
    d. ITW Ramset/Red Head.
    e. MKT Fastening, LLC.
    f. Powers Fasteners.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support piping.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 4000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT PROJECT SPECIFIC REQUIREMENTS

A. Refer to individual piping specifications for specific requirements of the type of hangers and supports to utilize.

3.2 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Galvanized Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

4. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
5. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
6. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
7. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
8. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
9. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
10. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
11. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
12. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

M. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.3 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attaching clamps and spacers to piping and insulation.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert. Maintain continuous insulation and vapor barrier.
    c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.

7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.4 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.7 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 0529

SECTION 22 0553 – PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and the Standard Form of Agreement apply to this Section.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing system identification materials and devices.

1.3 SUBMITTALS

A. Product Data: For identification materials and devices.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with ASME A13.1, “Scheme for the Identification of Piping Systems” for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 IDENTIFYING DEVICES AND LABELS

A. General: Products specified are for applications referenced in other Division 23 Sections. If more than a single type is specified for listed applications, selection is Installer’s option. Subject to compliance with requirements, manufacturers offering mechanical identification materials which may be incorporated in the work include but not limited to, the following:

1. Seton Name Plate Co.
2. National Marker Co.
3. Marking Services, Inc.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating, and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

C. Snap-On Plastic Pipe Markers: Manufacturers standard preprinted, semi-rigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

1. Acceptable Product: Seton Identification Products “Set Mark”.

D. Pressure-Sensitive Pipe Markers: Manufacturers standard preprinted, color coded, pressure-sensitive, vinyl type with permanent adhesive.

1. Acceptable Product: Seton Identification Products “Opti-Code”.

E. Pipes with OD, Including Insulation, Less than 6 inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 inches and larger: Either full-band or strip-type pipe markers, at least 3 times letter height and of length required for label.

G. Lettering: Manufacturer’s standard preprinted captions as selected by Engineer.

1. Arrows: Either integrally with piping system service lettering, to accommodate both directions, or as separate unit, on each pipe marker to indicate direction of flow.

H. Plastic Tape: Manufacturer’s standard color-coded, pressure sensitive, self-adhesive, vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated
3. Acceptable Product: Seton Identification Products “Marking Tape”.

I. Valve Tags: Engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
2. Size: 1-1/2-inches diameter, unless otherwise indicated.
3. Acceptable Product: Seton Identification Products “Style No. 31496”.

J. Valve Tag Fasteners: Plastic cable tie.

K. Access Panel Markers: 1/16-inch- thick, engraved plastic-laminate markers, with abbreviated terms, and numbers corresponding to concealed valve. Provide pressure-sensitive permanent adhesive backing.

1. Acceptable Product: Seton Identification Products “Opti-Code”.

L. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver’s standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/16 inch, for units up to 20 sq. in or 8 inches in length, and 1/8 inch for larger units.
3. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
4. Acceptable Product: Seton Identification Products “Engraved Data Name Plates”

M. Plastic Equipment Markers: Manufacturer’s standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: use colors and designs recommended by ASME A 13.1.
6. Terminology: Match schedules as closely as possible. Include the following:
   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

N. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3 by 5-3/4 inches.
2. Fasteners: Brass grommets and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPETATE.
4. Acceptable Product: Seton Identification Products “Style No. M3361”.

O. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

PART 3 - EXECUTION

3.1 LABELING AND IDENTIFYING PIPING SYSTEMS

A. Install pipe markers on each system. Include arrows showing normal direction of flow.

B. Marker Type: Plastic markers, with application systems. Install on pipe insulation segment where required for hot, non-insulated pipes.

C. Fasten markers on pipes and insulated pipes smaller than 6 inches OD by one of the following methods.

1. Snap-on application of pre-tensioned, semi-rigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe or insulation.
4. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 3/4 inch wide, lapped a minimum of 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

D. Fasten markers on pipes and insulated pipes 6 inches in diameter and larger by one of following methods:

1. Laminated or bonded application of pipe marker to pipe or insulation.
2. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 1-1/2 inches wide, lapped a minimum of 3 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Strapped to pipe or insulation with manufacturer’s standard stainless-steel bands or plastic cable ties.

E. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations according to the following:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
3. Near penetrations through walls, floors, ceilings, or non-accessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaces at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in area of congested piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.2 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; and terminal devices and similar roughing-in connections of end-use terminal units.

B. Tag Material: Plastic

3.3 ADJUSTING AND CLEANING

A. Relocate identification materials and devices that have become visually blocked by work of this or other Divisions.

END OF SECTION 22 0553

SECTION 22 0700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Flexible elastomeric.
   b. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.

1.3 DEFINITIONS

1. ASJ: All Service Jacket
2. FSK: Foil Scrim Kraft

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.
8. Detail field application for each equipment type.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell foam or expanded rubber tubular materials with both a moisture seal and a reinforced elastic foam PSA lap seal closure system complying with ASTM C 534, type 1, Grade 1.

1. Products: Subject compliance with requirements, provide from the following or approved equal.
   a. Armacell LLC
   b. K-Flex USA
2. Acceptable Product: www.armacell.com Armacell LLC Model “Lap Seal”.

E. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include:
   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

F. Mineral-Fiber Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ Jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include:
   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Duct Wrap.
   d. Owens Corning; All-Service Duct Wrap.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements provide one of the following.
   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto PVC Corporation; LoSmoke.
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
5. Factory-fabricated tank heads and tank side panels.

C. Metal Jacket:

1. Subject to compliance with requirements provide one of the following.
   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
   a. Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
   b. Factory-Fabricated Fitting Covers:

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

F. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

G. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-

inch diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from aluminum 0.050 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers,

valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturers recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with

weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
   a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of pipe/fitting of each type.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water, Domestic Hot and Recirculated Hot Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Storm water and Overflow, Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be pre-formed as manufactured by Truebro.

END OF SECTION 22 0700

SECTION 22 1116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes domestic water piping, fittings, and flexible connectors downstream of the water meter, unless otherwise indicated.

B. Related Sections:

1. Section 22 0523 – Plumbing Valves and Specialties
2. Section 22 0700 – Plumbing Insulation

1.3 WATER SERVICE REQUIREMENTS

A. The existing water service lateral shall be reused but re-routed to the new basement. Reuse the meter. Provide new backflow preventer to comply with plumbing code and water company requirements.

1.4 SUBMITTALS

A. Product Data: For piping materials, fitting, and specified products.

B. Certifications for pressure joint installation personnel.

C. Field quality-control reports and water test samples.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Installer of Pressure-Sealed Joints: Individuals making pressure-sealed joints shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings. Submit certifications.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in Part 3 "Piping Schedule" for permitted use and applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series copper-phosphorus alloys for general-duty brazing.

C. Copper Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Acceptable manufacturers:

1. Viega
2. Nibco, Inc.
3. Victaulic ‘Pressfit’
4. Or approved equal.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

PART 3 - EXECUTION

3.1 PIPING SCHEDULE

A. Where multiple pipe and/or fitting types are listed below for each application, selection is Contractor’s option unless otherwise indicated on the Drawings.

B. Domestic water service entrance piping shall be one of the following:

1. Type K copper

C. Aboveground domestic water piping, NPS 2 and smaller shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L

a. wrought copper solder-joint fittings; and soldered joints.
b. grooved joints and fittings.
c. press joints and fittings.

D. Transition and special fittings with pressure ratings at least equal to piping rating shall be used in applications above.

3.2 PIPING INSTALLATION

A. General: Drawing plans and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping generally as indicated unless deviations to layout are approved by the Architect/Engineer.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook." Insulate with 1” thick closed cell foam, lay in a 6-inch bed of sand and cover with 6 inches of sand.

C. Slope: Install piping free of sags and bends and with 0.25 percent slope downward toward drain.

D. Concealed Locations: Install piping concealed from view and protected from physical contact unless otherwise indicated and except in unfinished equipment rooms and service areas. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

E. Exposed Locations: Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Service Access: Install piping adjacent to equipment and specialties to allow service and maintenance.

G. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

H. Fittings: Install fittings for changes in direction and branch connections. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty. Flanges and unions may be used for aboveground piping unless otherwise indicated.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are damaged.

C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Ductile Iron Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints. A factory-trained manufacturer's field representative shall provide on-site training for installers in the proper use of grooving tools and installation of grooved piping products. The representative shall periodically review the installation and ensure recommended practices are being followed.

F. Press Fittings and Joints: Copper press fittings shall be made in accordance with the manufacturer's installation instructions using approved o-ring gaskets. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "Plumbing Valves and Specialties" for valve installations.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Plumbing Hangers and Supports" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer than 100 Feet: MSS Type 43, adjustable roller hangers.
3. Multiple, Straight, Horizontal Piping Runs 100 feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

B. Support vertical piping and tubing at base and at each floor. Install supports for vertical copper tubing every 10 feet minimum.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2 to NPS 6: 96 inches with ½-inch rod.

E. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping.

D. Extend and connect domestic water piping to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 Section “Plumbing Fixtures” for connection sizes.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.8 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Install cast-iron sleeve at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 23 Section 22 0553 for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.11 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

A. Cleaning and flushing of new piping shall be done as work progresses or upon completion of the system. Do not connect new pipe to active piping systems until all flushing and cleaning has been done. Provide temporary pipe connection and flushing pump.

B. Clean and disinfect potable and domestic water piping as follows:

1. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.
2. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
3. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:
        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

END OF SECTION 22 1116

SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes soil, waste, and vent piping and specialties. Refer to Drawings for related product requirements and Basis-of-Design products.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water

1.5 SUBMITTALS

A. Product Data: For pipe fittings, hangers, and couplings plus other specified products.

B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-DWV" for plastic drain, waste, and vent piping;

C. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

B. Refer to Drawings for detailed requirements and Basis-of-Design drainage products.

2.2 CAST-IRON HUB-AND-SPIGOT SOIL PIPE AND FITTINGS

A. Cast Iron Pipe and Fittings: ASTM A74, service weight class.

B. Gaskets: ASTM C564, rubber and ASTM D1563.

2.3 CAST-IRON HUBLESS SOIL PIPE AND FITTINGS

A. Cast Iron Pipe and Fittings: ASTM A888 or CISPI 301, service weight class.

B. Shielded Couplings: ASTM C1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: ASTM C 1277 and CISPI 310; with stainless-steel corrugated shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
2. Heavy-Duty, Shielded, Stainless-Steel Couplings: ASTM C1540; with stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

2.4 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D2665, Schedule 40 solid-wall. Note - cellular or foam core products are not acceptable.

B. PVC Fittings: ASTM D2665, Schedule 40 DWV drain, waste, and vent pattern fittings.

C. Solvent Cement and Adhesive Primer:

1. Use PVC solvent cement and primer that have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Prohibited Use: PVC piping systems shall not be used where sanitary/vent piping systems are installed within a ceiling return air plenum. Contractor shall verify all plenum locations with other trades and coordinate accordingly.

2.5 SPECIAL PIPE FITTINGS

A. Flexible, Non-pressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Sleeve Materials:
   a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Non-pressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

C. Rigid, Unshielded, Non-pressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

1. Center-Sleeve Material: Manufacturer's standard
2. Gasket Material: Natural or synthetic rubber.
3. Metal Component Finish: Corrosion-resistant coating or material.

E. Manufacturers:

1. Fernco, Inc.
2. NDS, Inc.
3. Plastic Oddities, Inc.
4. Dresser, Inc.
5. Or approved equal.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Refer to Drawings for permitted piping system materials for each application. Where not indicated, installer may select from the products listed below in conformance with applicable building code restrictions.

B. Aboveground gravity sanitary drainage piping:

1. Service class, cast-iron soil pipe and fittings, hub-and-spigot gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard shielded, stainless-steel couplings and coupled joints.
3. Schedule 40 PVC pipe, PVC socket fittings; solvent-cemented joints. Do not use PVC within ceiling return air plenums.
4. Galvanized steel pipe, threaded fittings.

C. Underground gravity sanitary drainage piping:

1. Service class, cast-iron soil pipe and fittings; hub-and-spigot gasketed joints.
2. Schedule 40 PVC pipe, PVC socket fittings; solvent-cemented joints.
3. Transitions to different pipe materials shall be made with heavy-duty shielded couplings.

3.3 PIPING INSTALLATION

A. General:

1. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
2. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
3. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
4. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

B. Cast Iron Pipe:

1. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

C. PVC Piping:

1. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
2. Install underground PVC soil and waste drainage piping according to ASTM D 2321. Provide proper backfill material and compaction for full support of the pipe on the bottom and sides. Provide compacted granular backfill.

D. Pipe Slope:

1. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   a. Building Sanitary Drain: Unless otherwise indicated on the Drawings, install at 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
   b. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   c. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

E. Cleanouts:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

2. Provide cleanouts to meet NSPC spacing.

F. Building penetrations:

1. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
2. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight

3.4 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer than 100 Feet (30 m), if indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
5. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
6. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

I. Install supports for vertical copper tubing every 10 feet (3 m).

J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and 5 (DN 100 and 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

K. Install supports for vertical PVC piping every 48 inches (1200 mm).

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

M. Cast-iron pipe and fittings (hub and spigot and hubless) five inch and larger shall be braced to prevent horizontal and vertical movement. Support shall be provided at every branch connection and change in direction by the use of braces, blocks, rodding, or other effective method to prevent movement and joint separation.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure

this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 1316

SECTION 22 1320 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes storm (roof) drain piping and specialties. Refer to Drawings for related product requirements and Basis-of-Design products.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Gravity Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, fittings, couplings, drains, and other specified products.

B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

C. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

B. Refer to Drawings for detailed requirements and Basis-of-Design drainage products.

2.2 CAST-IRON HUB-AND-SPIGOT SOIL PIPE AND FITTINGS

A. Cast Iron Pipe and Fittings: ASTM A74, service weight class.

B. Gaskets: ASTM C564, rubber and ASTM D1563.

2.3 CAST-IRON HUBLESS SOIL PIPE AND FITTINGS

A. Cast Iron Pipe and Fittings: ASTM A888 or CISPI 301, service weight class.

B. Shielded Couplings: ASTM C1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: ASTM C 1277 and CISPI 310; with stainless-steel corrugated shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
2. Heavy-Duty, Shielded, Stainless-Steel Couplings: ASTM C1540; with stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

2.4 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D2665, Schedule 40 solid-wall. Note - cellular or foam core products are not acceptable.

B. PVC Fittings: ASTM D2665, Schedule 40 DWV drain, waste, and vent pattern fittings.

C. Solvent Cement and Adhesive Primer:

1. Use PVC solvent cement and primer that have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIAL PIPE FITTINGS

A. Flexible, Non-pressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Sleeve Materials:
   a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Non-pressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

C. Rigid, Unshielded, Non-pressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

1. Center-Sleeve Material: Manufacturer's standard
2. Gasket Material: Natural or synthetic rubber.
3. Metal Component Finish: Corrosion-resistant coating or material.

E. Manufacturers:

1. Fernco, Inc.
2. Mission.
3. Plastic Oddities, Inc.
4. Dresser, Inc.
5. Or approved equal.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Refer to Drawings for permitted piping system materials for each application. Where not indicated, installer may select from the products listed below in conformance with applicable building code restrictions.

B. Aboveground gravity storm drainage piping:

1. Hub-and-spigot service class, cast-iron soil pipe and fittings, gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard shielded, stainless-steel couplings and coupled joints.
3. Schedule 40 PVC pipe, PVC socket fittings; solvent-cemented joints.
4. Galvanized steel pipe, threaded fittings.

C. Underground gravity storm drainage piping:

1. Service class, cast-iron soil pipe and fittings; hub-and-spigot gasketed joints.
2. Schedule 40 PVC pipe, PVC socket fittings; solvent-cemented joints.
3. Transitions to different pipe materials shall be made with heavy-duty shielded couplings.

3.3 PIPING INSTALLATION

A. Insulate piping per 220700.

B. Cleanouts:

1. Install cleanouts at grade and extend to where building drains connect to building sewers.

C. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

D. Install wall sleeve assembly with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

1. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

E. Install cast-iron piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

F. Install PVC drainage piping according to ASTM D 2665. Install underground PVC drainage piping according to ASTM D 2321.

G. Make changes in direction for drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried gravity drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install gravity drainage piping at the slopes indicated on the Drawings, or following the minimum slopes indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer than 100 Feet (30 m), if indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

H. Install supports for vertical PVC piping every 48 inches (1200 mm).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

J. Cast-iron pipe and fittings (hub and spigot and hubless) five inch and larger shall be braced to prevent horizontal and vertical movement. Support shall be provided at every branch connection and change in direction by the use of braces, blocks, rodding, or other effective method to prevent movement and joint separation.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

D. Connect force-main piping to the following:

1. Storm Sewer: To exterior force main or storm manhole.
2. Sump Pumps: To sump pump discharge.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 1320

SECTION 22 5310- FUEL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fuel gas piping, specialties, and accessories within the building.

1.3 GAS SERVICE

A. The existing gas meter shall be reused.

B. The plumbing contractor shall paint all exposed steel pipe with primer and 2-coats of gray enamel.

C. The building gas distribution system will be 1/4 psi (7 inches) as shown on the drawing.

D. The building gas distribution system will be 2 psi reduced to 7 inches at each appliance. Provide a pressure reducer at each appliance.

1.4 PROJECT CONDITIONS

A. Gas System Pressure: One pressure range. 0.5 psig or less.

B. Design values of fuel gas supplied for these systems are as follows:

Natural Gas

1. Nominal Heating Value: 1000 Btu/cu. Ft.
2. Nominal Specific Gravity: 0.6.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
2. Pressure regulators. Include pressure rating, capacity, and settings of selected models.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

C. Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

A. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."

B. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

C. NFPA 54 – National Fuel Gas Code, for gas piping materials and components, gas piping installations, and inspection, testing, and purging of gas piping systems.

D. International Mechanical Code and International Fuel Gas Code.

E. National Propane Gas Association (NPGA), 1031 West 22nd Street, Oak Brook, IL 60521.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.8 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Polyethylene Type II, Grade 3 PE 2306, ASTM D1248 and D2513:
   a. Central Plastics.
   b. Oil Creek Plastics.
   c. Charter Plastics.
2. Appliance Connector Valves:
   a. American Valve.
   b. Brass Craft Manufacturing Co.
   c. Conbraco Industries, Inc.; Apollo Div.
   d. Mueller Co.; Mueller Gas Products Div.
   e. Watts Industries, Inc.; Water Products Div.

3. Gas Valves
    a. Crane Valves.
    b. Mueller Co.; Mueller Gas Products Div.
    c. Nibco, Inc.
    d. Red-White Valve Corp.
    e. Watts Industries, Inc.; Water Products Div.
4. Line Pressure Regulators:
    a. American Meter Co.
    b. Fisher Controls International, Inc.
    c. Maxitrol Co.
    d. National Meter.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
3. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
4. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
5. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
6. Joint Compound and Tape: Suitable for natural gas.
7. Steel Flanges and Flanged Fittings: ASME B16.5.
8. Gasket Material: Thickness, material, and type suitable for natural gas.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. OmegaFlex, Inc.
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.
    d. Tru-Flex Metal Hose Corp.
2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.
    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
        1) Flame-Spread Index 25 or less.
        2) Smoke-Developed Index: 50 or less.
4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without

gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.

5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig

2.4 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.5 GAS VALVES

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: threaded ends.
2. Ball Valves: two piece, full port, bronze with bronze trim.

B. Pipe NPS 2-1/2 and larger

1. Plug valves

2.6 SPECIALTY VALVES

A. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges.

C. Appliance Connector Valves: ANSI Z21.15 and IAS listed.

D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.

E. Gas Valves, NPS 2 and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig pressure rating.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

B. Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

3.2 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.

1. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for dielectric fittings.

3.3 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 0.5 to 5 psig: Use the following:

1. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joints or Corrugated, Stainless-Steel Tubing
2. NPS 3/4 to NPS 2: Steel pipe, malleable-iron threaded fittings, and threaded joints or Corrugated, Stainless-Steel Tubing.
3. Larger Than NPS 2: Steel pipe, steel welding fittings, and welded joints.

C. Underground Fuel Gas Piping: Polyethylene plastic with heat fusion joints and fittings. For potion of steel pipe partially below grade the pipe shall be protected with Scotchrap Pipe Primer and Scotchrap Tape.

3.4 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 to 5 psig: Gas stop or gas valve.

B. Piping Line Valves, NPS 2 and Smaller: Gas valve.

C. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve or general-duty valve.

3.5 PIPING INSTALLATION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
2. In Floors: Do not embed piping in or below concrete slabs.
3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.
4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
    a. Exception: Tubing passing through partitions or walls.
5. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.
6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

J. Install pressure gage downstream from each line pressure regulator.

K. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.

L. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Section 230050 for special sealers and materials.

M. For the Corrugated, Stainless-Steel Tubing follow manufacturer's installation instructions.

3.6 JOINT CONSTRUCTION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 22 Section 22 0529 "Hangers and Supports" for pipe hanger and support devices.

B. Support all piping on the roof with Miro roller-bearing supports.

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Provide flexible connector pipe and quick connect device for all appliances that must be moved for servicing. This shall include but not limited to kitchen cooking equipment and clothes dryers.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

F. This Contractor shall be responsible for the entire gas service, distribution piping and final connections to all gas using devices. Final connections are required even for equipment provided by others.

3.9 PIPE PROTECTION

A. All underground steel pipe shall be protected from corrosion. Utilize a Scotchrap Pipe Primer. Let dry then wrap with Scotchrap 51 tape as instructed by the manufacturer.

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.

1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
2. Provide labels on the piping every 25 feet and in every room, which ever is less identifying the pipe as “GAS” and pressure: IE “2-PSI”. Provide engraved plastic-laminated sign at the main service indicating the distribution pressure. Refer to Section 230553 for requirements on the type of labeling to use.

3.11 PAINTING

A. Paint exterior service meters pipe, pressure regulators, and specialty valves. Paint all other gas pipe exposed to the weather. (This includes all exposed piping on the roof.) Clean all surfaces free from dirt, grease, rust, and loose paint. Prime then paint with two coats of industrial enamel.

1. Color: Gray Yellow

3.12 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.13 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

3.14 PRESSURE TESTING

A. Prior to backfilling and enclosing of piping in building the piping shall be leak tested as described in the National Fuel Gas Code NFPA #54. The test medium shall be air or an inert gas such as nitrogen. OXYGEN SHALL NEVER BE USED. The test pressure shall be 5 psig. Leakage points shall be located by means of an approved combustible gas detector or soap and water. OPEN FLAMES OR OTHER METHODS WHICH COULD PROVIDE A SOURCE OF IGNITION SHALL NOT BE USED. Repair leaks and retest.

B. Contact Engineer or Owner's representative to inform them of installation schedule and to witness pressure testing of piping. Provide copy of signed test report to the Engineer.

END OF SECTION 22 5310

SECTION 23 0010 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Divisions 22, and 23.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for Mechanical and Plumbing system installations. It is intended to supplement Division 1 sections. Any conflicts shall be brought to the attention of the Design Professional(s) for clarification.

B. Furnish and install all work indicated and specified in accordance with these specifications and accompanying contract drawings. This shall include all required labor, materials, equipment, programming, testing, and supervision.

1.3 DEFINITIONS

A. The following definitions used in mechanical and electrical sections are in addition to those listed in Supplementary General Conditions:

1. Provide: Shall mean "furnish and install" indicated work.
2. Install: Installation of item and all necessary related work to provide fully operational devices.
3. Furnish: Procurement and delivery to jobsite of equipment for installation.
4. Remove: Disconnect and take from existing location, including accompanying sealant, supports, anchors, and associated materials, and remove from the site for legal disposal or recycling, or store and protect for reinstallation when noted.
5. Replace: Remove and provide new.
6. Re-install: Install existing item in same or new location as indicated. Provide all necessary hardware, supports, extension of existing services, etc as required.
7. Herein: shall mean the contents of a particular section where this term appears.
8. Indicated: Indicated on contract drawings.
9. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, unpainted storage areas without ceilings, chases and shafts, attics, ceiling plenums, unexcavated spaces, crawl spaces, and tunnels.
10. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
11. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
12. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in walls or shafts.
13. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to

outdoor ambient temperatures. Examples include installations within unheated shelters.

14. Listed or labeled shall mean as defined in NFPA 70 Article 100, by a Testing Agency acceptable to Authorities having jurisdiction (AHJ) and marked for intended use.
15. Piping: Includes pipe, fittings, valves, hangers, and other accessories which comprise a system.
16. Wiring: Conduit, fittings, wire, junction and outlet boxes, switches, and items necessary or relating to such wiring.
17. Work: The labor, equipment, and materials required as part of the project.
18. Trades: refers to those specifically skilled in the work performed under a particular section of this contract.

1.4 CONTRACTOR

A. The term "Contractor" which is used within these drawings and specifications shall be understood to mean the single prime contractor or firm awarded the single contract for the project. References to various other contractor entities (i.e., mechanical contractor (MC), electrical contractor (EC), plumbing contractor (PC), general contractor (GC), site contractor, bas contractor, etc.) shall be understood to mean a sub-contractor to the prime contractor. The prime contractor or firm awarded the single contract shall be solely responsible for providing all systems specified here within.

1.5 TRUE INTENT

A. The drawings and specifications are intended to describe a complete operating system. All labor, material or equipment, which is not specified or indicated but is necessary for the operation and completion of a properly operating system, according to the true intent of the specifications and drawings and as interpreted by the Design Professional(s), shall be furnished as a part of the contract, as though it were specifically detailed and described.

B. Coordinate and assign work such that all work and materials are provided and coordinated between all subcontractors and suppliers to provide complete and operational systems. The specification format, section numbers and drawing numbering or nomenclature is not intended to assign work within the Contract.

1.6 EXAMINATION OF THE SITE

A. Bidders shall carefully examine specifications and drawings, visit the site of proposed work and observe all existing conditions and limitations and include any work required due to the existing conditions and limitations. Request clarifications from the architect/engineer regarding discrepancies between existing conditions and drawings and specifications prior to bidding. Submission of a bid shall indicate that bidder is familiar with existing conditions to be met in execution of the work and has included such work in his bid. Failure to visit and inspect the existing conditions shall not be a valid reason for authorization of a change order.

1.7 DIMENSIONS, GRADES AND SURVEYS

A. Dimensions, grades, elevations and locations shown on the Drawings are approximate. Verify all lines, grades and dimensions prior to starting the work. All necessary measurements, surveys, lines, grades, and elevations are the responsibility of the Contractor. Verify all lines and grades with the local controlling agency, AHJ or other party where required.

1.8 PERMITS, FEES AND CODES

A. Unless otherwise directed, Contractor shall obtain and pay for all third-party review fees, building permits, inspections, tests, and certificates relating to the work as required by any of the Authorities Having Jurisdiction. All inspection certificates shall be delivered to the Design Professional(s) and become property of the Owner.

B. Perform all work in compliance with the codes, laws, ordinances, rules or regulations of federal, state, or local Authorities Having Jurisdiction over the premises. All such codes, laws, ordinances, rules and regulations are hereby incorporated and made a part of these specifications.

C. Work shall be done in accordance with, but not limited to, the applicable sections of the latest edition and supplement to the following Codes and Standards:

1. ANSI American National Standard Institute
2. ASTM American Society for Testing and Materials
3. FM Factory Mutual Systems
4. NEMA National Electrical Manufacturers Association
5. NFPA National Fire Protection Association
    a. 13 - Sprinkler Systems
    b. 70 - National Electric Code; 2017
    c. 54 - National Fuel Gas Code
    d. 90A - Installation of Air-conditioning and Ventilating systems
    e. 91 - Blower and Exhaust Systems
6. UL Underwriters Laboratories, Inc.
7. SMACNA Sheet Metal and Air Conditioning Contractors' National Association
8. IBC International Building Code; 2018
9. IMC International Mechanical Code; 2018
10. IPC International Plumbing Code; 2018
11. IECC International Energy Conservation Code; 2018
12. IFGC International Fuel Gas Code; 2018
13. All relevant sub-codes adopted by the local AHJ.

D. The drawings and specifications are not intended to conflict with the above documents. Request clarifications from the Design Professional(s) regarding discrepancies between relevant codes and the drawings and specifications prior to bidding. Submission of a bid shall indicate that bidder is familiar with the applicable code requirements and has included such work in the bid.

E. All work performed on this project and all equipment furnished for this project shall be in conformance with the regulations and requirements of the Occupational Safety and Health Act (OSHA). The Contractor is solely responsible for compliance with OSHA regulations. All purchased equipment shall be designed, manufactured, and furnished with the necessary accessories to meet OSHA requirements. All construction facilities,

including ladders, platforms, guard rails, safety features, etc. shall meet OSHA requirements.

1.9 DAMAGES

A. Contractor is responsible to repair or replace damage caused by employees to the site, building or building mechanical/electrical systems during the execution of the work. Repairs or replacement shall be completed to the satisfaction of the Design Professional(s) and Owner.

B. The above paragraph applies to damages which occur to existing conditions (portions of the building in place before renovations) or new work installed during the progress of the project.

1.10 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new, and shall conform to the grade, quality and standards specified.

1. Where required by applicable bidding requirements and Division 1 sections, materials and equipment shall meet applicable USA steel certifications and/or shall be manufactured in the USA.

B. All equipment shall be limited to products regularly produced for the intended service, in accordance with manufacturer’s engineering data, rating, and literature. Major items of equipment shall be manufactured for the intended purpose in commercial practice and shall have the manufacturer’s name, address and catalog number affixed in a prominent place.

C. Equipment shall be installed in strict accordance with manufacturer's instructions for type and capacity of equipment used. Manufacturer’s instructions shall be considered part of the specifications. Type, capacity and application of equipment shall be suitable and shall operate satisfactorily for the purpose intended.

D. Equipment used as the basis-of-design as indicated on the Drawings defines the general space requirements, weights and related services (electrical services, piping connections, etc.). Provide equipment of similar size, requirements and clearances which shall not necessitate revisions to the building construction or other trades. If revisions are required due to substitution the Contractor shall pay all costs for any required revisions. No revisions shall be made without Design Professional(s) written approval.

E. Pressure Vessels

1. All tanks subjected to pressure shall conform to A.S.M.E. Code and the regulations of the controlling State Agencies. They shall bear the stamp of A.S.M.E. Test Code Compliance and National Insignia Number and the required stamp of any controlling State agency. This shall include but not be limited to boilers, water heaters, expansion tanks, storage tanks, and heat exchanger barrels. In addition, provide adequate and code required clearance around all equipment.

1.11 PERFORMANCE OF EQUIPMENT

A. All materials, equipment and systems specified or required for the completion of the work, shall be completely satisfactory and acceptable in operation, performance, and capacity. No approval, either written or verbal, of any drawings, descriptive data of samples of such material, equipment and/or appurtenances, shall relieve the Contractor of his responsibility to provide systems in complete working order at the completion of the work.

B. Any material, equipment, or appurtenances, which does not comply with the drawings and/or specification requirements, or which is not new, or which is damaged prior to acceptance by the Architect/Engineer, shall be removed and replaced with acceptable materials, equipment and/or appurtenance or put in acceptable working condition, to the satisfaction of the Design Professional(s).

C. All equipment and systems shall be electrically and mechanically correct. All equipment and systems shall operate without objectionable noise or vibration as determined by the Design Professional(s). Eliminate any objectionable noise or vibration produced and transmitted to occupied portions of the building by any system or equipment, to the satisfaction of the Design Professional(s) and Owner.

1.12 CUTTING AND PATCHING

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Cutting and Patching". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professional(s).

B. New Construction: The Contractor shall coordinate complete information as to size and exact location of openings and/or sleeves required in new floors, walls, or roofs with the applicable sub-contractors such that openings are provided in new construction as the work progresses.

1. Supports: Provide framed roof or floor openings and lintels in new masonry walls.
2. Roofing: Provide roof flashing work in conjunction with the project's roofing installation.
3. If openings are omitted or are incorrect through failure to follow these instructions, the Contractor shall be responsible for cutting and patching of the construction in a manner approved by the Design Professional(s).

C. Existing Construction: The Contractor shall cut and patch existing building construction as required for the installation of new work, unless otherwise noted. All cutting and openings shall be approved by the Design Professional(s).

1. Patching: All patching of existing surfaces shall match the existing construction finish.
2. Supports: All openings made in existing floors, walls, roof decks, etc. shall be supported in a manner approved by the Design Professional(s) to maintain the structural integrity of the construction. The Contractor shall provide lintels in all masonry wall openings and structural steel angle framed openings for all roof and floor penetrations. Submit drawings depicting each framed opening and lintel size, type, and location to the Design Professional(s) for review and acceptance.

3. Roof Work: Cutting and patching of the existing roof as required to install new systems and equipment, and/or the removal of existing systems, shall be performed by an approved and certified roofing contractor. Patching and flashing of the existing roof shall be made with materials and methods certified by the existing roofing manufacturer.
    a. Warranty: Roofing work shall be performed by a contractor approved by the existing roofing manufacturer in order to maintain the existing roofing warranty.

D. General: All cutting and patching shall be done by mechanics experienced in their respective lines of work.

1. All cutting shall minimize damage to adjacent surfaces. If damage occurs the Contractor shall replace or repair the damaged materials with new materials in a manner approved by the Design Professional(s).
2. When necessary to cut and remove portions of any walls, floors, ceilings, roof or site work to perform the work, Contractor shall perform cutting and fitting, remove all excess material, and patch or replace all damaged construction in a manner approved by the Design Professional(s).
3. No cutting shall be done which may affect the building structurally or architecturally. Any damage incidental to cutting or other causes in the performance of this Contract shall be made good by replacement or repairs. Cutting shall be done only with the prior approval of the Design Professional(s).
4. Patch all openings left in existing walls, floors and ceilings when obsolete materials are removed. Match adjacent construction and finishes.

E. Patch and/or seal all openings or penetrations made in fire rated floors, ceilings or partitions after work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material. All fire sealant material shall be U.L. classified and approved by the Design Professional(s).

1.13 RUBBISH REMOVAL AND CLEAN-UP

A. Periodically, and at the completion of the work, remove from the building and site all rubbish and accumulated materials, and leave the workplace in a clean, orderly and acceptable condition. Provide dumpsters, trash containers, hauling and approved disposal fees associated with the work.

B. Clean all installed materials and equipment of paint splashes, grease stains, dust, finger marks, and all other unsightly marks prior to substantial completion inspection.

1.14 TESTS AND CERTIFICATIONS

A. The following requirements are supplementary to test requirements specified in individual equipment or systems Sections.

1. Written notice of test date shall be given to Design Professional(s) and other parties at least 72 hours prior to tests.
2. Concealed work shall remain uncovered until required tests have been completed.

3. Conduct preliminary test of equipment as soon as conditions permit. Make changes, adjustments, or replacements based on test results prior to final acceptance tests.
4. Conduct performance and operating tests for each system or equipment in presence of the Design Professional(s). Coordinate testing with the manufacturer's representative and/or AHJ when required.
5. Furnish labor, material, and instruments and include all other costs in connection with tests.
6. Obtain certificates of approval and/or acceptance in compliance with regulations of AHJ. Work shall not be complete until such certificates have been delivered to the Design Professional(s) and Owner.

B. Contractor shall certify after testing that all systems and equipment operate safely, efficiently, and in accordance with manufacturer's instructions and the intent of the drawings and specifications.

1.15 PROTECTION AND CLEANING

A. Protect work and materials against dirt, water, chemicals, plaster or damage. All openings in stored or installed materials (pipes, ductwork, conduit, etc.), shall be sealed to exclude dirt, sand, and other foreign substances. Any damaged materials shall be removed and replaced regardless of the cause of the damage. Refer to specific piping and ductwork specifications for additional requirements for the protection of stored materials.

B. Protect all surfaces against damage from welding, cutting, burning, soldering or similar construction functions. Special care shall be directed to exposed finished masonry, metal or wood surfaces, painted surfaces, finished flooring, and finished ceilings.

C. Any damage caused by Contractor's neglect or by the elements due to the Contractor's neglect, either to existing work, or to his work shall be repaired or replaced in a manner approved by the Design Professional(s).

D. Clean all materials and equipment to remove all paint, grease, oil, scale, rust, dirt, mud, dust, sand, and other foreign material prior to substantial completion inspection. Remove traces of any cleaning materials. Clean the interior of all cabinets, fixtures and equipment and remove dust, dirt and debris.

1.16 QUALITY OF WORKMANSHIP

A. All work shall be installed in a first class, neat and workmanlike manner by mechanics skilled in the trade involved. The quality of workmanship shall be subject to the approval of the Design Professional(s). Any work of inferior quality and/or workmanship shall be corrected in a manner acceptable to the Design Professional(s).

1.17 SUBSTITUTIONS

A. Various products are used as the Basis-of-Design for systems and equipment and are specified by a manufacturer's name and model number. Unless otherwise indicated, other manufacturer's products may be submitted for consideration as a substitution in

accordance with the requirements set forth in Instructions to Bidders and/or Division 1 sections, and as follows.

1. The Design Professional(s) shall be the sole judge as to the acceptance of a product that is submitted for acceptance as a substitution
2. The proposed substitute shall include all labor and materials required to install and operate the equipment in accordance with the original design concept, including the cost of any changes to work under this section, or other sections or Contracts, such as; access openings, equipment pads, supports, pipe or duct connections, motors, controls, electrical and control wiring.
3. Contractor shall verify that substitute equipment will fit into the designated spaces, verify that dimensions provide adequate space for the equipment and allow clearances for connections and servicing, and verify acceptance of any additional costs from other Contractors resulting from the substitute product, prior to submission to the Design Professional(s) for acceptance.

1.18 SUBMITTALS AND SHOP DRAWINGS

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Submittals". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professionals.

B. Prepare and submit a Submittal Schedule which shall include a list of products to be submitted and indicate the product manufacturer, model, and date the information will be submitted to the Design Professional(s). The schedule shall be submitted within two weeks after notice-to-proceed and prior to the submission of individual product submittals.

C. After acceptance of the Submittal Schedule, submit Shop Drawings and Submittals and obtain acceptance of the Design Professional(s) before any equipment is ordered or work is accomplished. Verify the required number of copies of each submittal to be submitted.

1. Submittals shall be in the form of clearly legible manufacturers printed catalogs, CAD-generated drawings, pamphlets, technical data, test information, and installation instructions. Clearly indicate the location, service and function of each particular item. Identification shall be made in ink with specific model numbers highlighted and accessories highlighted.
2. Submittals shall be completely referenced and identified. Descriptive information and data shall be complete. Submittals which only show partial or general information will not be acceptable and will be returned.
3. Shop Drawings and Submittals which are prepared by sub-contractors and vendors shall be checked and coordinated by the Contractor prior to submission to the Design Professional(s). Contractor shall check these drawings and submittals with respect to measurements, materials, identifications, and details so as to make certain that they conform to the intent of the Contract Documents and make any corrections before submission to the Design Professional(s).
4. Contractor shall inform the Design Professional(s), in writing, of any deviations in the shop drawings and submittals where the submitted item deviates from the Contract Documents. This written advisory shall accompany the initial submittal and shall state the reasons for the deviations.

D. The Design Professional(s) will check the Shop Drawings and Submittals for conformance with the Contract Documents. The Design Professional(s) acceptance of the Shop Drawings and Submittals does not release the Contractor from providing all specific requirements of the equipment and installation not listed in the Submittal but required by the Contract Documents.

E. Contractor shall be responsible for dimensions that are to be confirmed at the job site, for coordination in the ordering and assembly of systems and equipment, for information that pertains solely to fabrication processes or to techniques of construction, and for coordination of the work of all trades.

F. The following specific items and information shall be included in all Shop Drawings and Submittals:

1. Capacity and performance data as shown on the Equipment Schedules or as specified.
2. Complete descriptive data on the systems, equipment and specialties which are specified, scheduled, or shown, so that compliance with the Contract Documents can be determined.
3. Electrical wiring diagrams (power and control) for electric motor driven equipment.

G. Systems and equipment which have been installed without having been accepted by the Design Professional(s) may be rejected and be shall be replaced with products that are acceptable. Submittals and Shop Drawings used at the construction site shall have Design Professional(s) acceptance stamp.

H. Shop Drawings and Submittals shall be revised and submitted as often as necessary to obtain acceptance. Contractor shall not delay the progress of the work due to unnecessary delays in obtaining acceptance of all required Shop Drawings or Submittals.

1. Resubmit rejected Shop Drawings and Submittals within three weeks, or sooner if required by project schedule.
2. During the submittal process, obtain all of the information that will be required for the Operation and Maintenance Manuals.

I. Ductwork Shop Drawings: Ductwork drawings shall be based on approved Architectural, Structural, and Mechanical shop drawings and equipment submittals which relate directly to the installation of the Mechanical Systems. Contractor shall also rely on job conditions, the equipment that will be installed and actual field measurements in the preparation of the shop drawings.

1. The ductwork shop drawings shall clearly depict structural steel, grids, lights, sprinkler systems, and plumbing and HVAC piping mains in order to avoid interferences with structural steel, walls, and ceiling systems.
2. Shop drawings shall show the dimensions of the equipment and the relationship of equipment to walls, floors, and ceilings. The shop drawings shall be prepared on at least 24" x 36" sheets at a minimum scale of 1/4” = 1’-0”.

1.19 COORDINATION AND COORDINATION DRAWINGS

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Coordination Drawings". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professionals.

B. The Contractor shall coordinate the installation of all equipment and material with all trades/sub-contractors. The Contractor shall hold regular scheduling and coordination meetings during the construction process. If conflicts are found, and they cannot be worked out in the field, they shall be brought to the attention of the Design Professional(s).

C. The layout of building systems, equipment, fixtures, piping, ductwork, conduit, specialty items, and accessories indicated on the Contract Drawings is diagrammatic. Variations in alignment, elevation, and detail will be required to avoid interference and satisfy architectural and structural limitations. All such variations are not necessarily indicated.

D. Coordination drawings shall be prepared, reviewed and coordinated in advance of any work being performed in any area. The drawings and coordination shall follow the project phasing schedule where applicable.

E. Prepare coordination drawings to a scale of 1/4"=1'-0" or larger; detailing all elements, components, and systems of equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

    1. Prepare plans, sections and elevations to indicate the proposed locations of fixtures, piping, ductwork, conduit, equipment, and materials. Include the following:
        a. Clearances for installing and maintaining insulation.
        b. Clearances for servicing and maintaining equipment, including access door openings and component removal.
        c. Equipment connections, mounting and support details.
        d. Exterior wall and foundation penetrations.
        e. Fire-rated wall and floor penetrations.
        f. Sizes and locations of equipment pads and bases.
    2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
    3. Order of priority for construction space:
        a. Maintain scheduled finished ceiling height.
        b. Light fixtures
        c. Drainage piping (gravity flow).
        d. Ductwork.
        e. Cable trays
        f. Fire protection piping.
        g. Other piping.
        h. Conduit.

F. Prepare overall coordinated reflected ceiling plans which shall include, but not be limited to, air outlets and inlets, light fixtures, communication systems components, access doors, and other ceiling-mounted equipment or items.

1.20 ALIGNMENT

A. Where several devices, panels, controllers, bells, alarms, thermostats, switches, handles, etc., are to be installed in a common location, this equipment shall be lined up in a horizontal or vertical plane. Request interpretation from the Design Professional(s) for any unusual alignment conditions.

1.21 RECORD DRAWINGS

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Record Documents". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professionals.

B. In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
2. Approved substitutions, Contract Modifications, and actual equipment and materials installed. Revise schedules on the drawings.
3. Exterior underground equipment and materials located with triangulated dimensions.

1.22 OPERATION AND MAINTENANCE MANUALS

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Operation and Maintenance Data". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professionals.

B. In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Written description of system operation.
2. An equipment list for each piece of equipment furnished. The list shall be in order of equipment label and shall indicate the manufacturer, model number, serial number, and motor horsepower and voltage ratings.
3. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and list of replacement parts.
4. A copy of all final corrected equipment submittals, control diagrams, descriptive brochures, and a list of all parts of each piece of equipment.
5. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
6. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions, and lubrication charts and schedules.
7. Copies of all permits required for occupancy.

C. All of the materials shall be indexed, arranged categorically, and be bound in a rigid, plastic covered, three ring binder with an additional digital copy provided, in PDF format, as well. Provide tabs for each major section.

D. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, trouble shooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.

1.23 TRAINING AND INSTRUCTIONS

A. General: The Contractor shall refer to additional procedures specified in Division 1 Section "Demonstration and Training". If there is a conflict between Division 1 and the requirements outlined below, request clarification from the Design Professionals.

B. At the completion of the work, and before final acceptance of the building by the Owner, the Contractor, together with manufacturers' representatives and any applicable sub-contractor, shall instruct the Owner's designated representatives in the care, adjustment, maintenance and operation of equipment and systems.

C. A manufacturer's representative of each major component or system shall inspect his work, make final adjustments, place them in a satisfactory working condition, and instruct the owner in their operation. Each representative shall also provide a letter to the Design Professional(s) indicating that an inspection has been performed, instruction given, and the equipment is installed and operating in conformance with the manufacturer's written installation instructions.

1.24 GUARANTEES AND WARRANTIES

A. All work performed shall be guaranteed in writing by the Contractor for a period of one (1) year after substantial completion. The Contractor shall remedy any defects due to faulty materials or workmanship, and pay for any damage to other work resulting there from which appear within a period of one (1) year from date of occupancy or the date of the Owner's Certificate of Final Payment of the total contract, and in accordance with the terms of any special guarantees provided in the Contract. The Owner shall give notice of observed defects with reasonable promptness. All questions arising under this article shall be decided by the Owner notwithstanding final payment.

B. Refer to *TEMPORARY HEAT* section below for additional warranty/guarantee requirements if new HVAC systems are utilized for temporary heat.

1.25 TEMPORARY HEAT

A. Building permanent HVAC equipment may be used for temporary heat during construction provided the following conditions are met:

1. All return air grilles and/or return duct openings shall be provided with MERV-8 filtration media to minimize airborne contaminants from entering the return air ductwork system. This filtration media shall be changed on a regular basis, as needed. Inspection of filtration media will take place during routine construction reviews by the CM, Architect or Engineer. At the completion of work, the filtration media shall be removed.

2. At the completion of work, the Contractor shall provide new filtration media within the main air handlers.
3. HVAC units, system, and components warranty is not reduced. Warranty period begins at date of substantial completion.
4. Building is not excessively dusty. Fine dust from operations such as grinding, cutting and sanding shall be isolated from the HVAC system and temporary exhaust provided to remove the dust from the building.
5. The HVAC equipment is installed as part of the permanent HVAC systems as indicated on the Drawings.
6. All equipment and ductwork shall be cleaned to new condition prior to substantial completion.

B. Remove all temporary heating materials, equipment, hardware, accessories etc. when it is no longer required, and prior to substantial completion.

1.26 METHOD OF PROCEDURE

A. The Drawings accompanying these Specifications are diagrammatic and intended to indicate the approximate and relative locations of the materials and systems. Installation, connection, and inter-connection of all components of the systems shall be complete and made in accordance with the manufacturer's instructions and best practices of the respective trades.

B. Install all work and equipment at such time and in such manner as not to delay or interfere with any other trade performing work.

C. Coordinate with all trades as to the locations of different lines of pipe, ducts, conduit, and electrical equipment before erecting any Work, so as to avoid interference. In case of conflict, equipment shall be relocated, without additional cost, as directed by the Design Professional(s) regardless of which equipment was installed first.

D. Care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of any installed work. The Contractor will be held responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.

E. All items of labor, material and equipment not specified in detail or shown on the drawings but incidental to or necessary for the complete and proper installation and proper operation of the several branches of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the specifications or drawings.

F. The work is generally indicated on the mechanical, plumbing, fire protection and electrical drawings but additional related information and details may appear on other project drawings and/or specifications. All drawings and specifications are intended to be complimentary

1. Refer to the Architectural and/or Structural drawings, when applicable, for information such as locations of fire rated assemblies, ceiling types and heights, chase dimensions, structural steel dimensions, etc.

2. The Architectural Drawings and details shall govern the location and arrangement of equipment, mounting heights, and similar conditions within finished spaces.
3. Notify the Design Professional(s) of any discrepancies between any of the drawings and/or the specifications prior to installation.

G. The drawings are diagrammatic in nature and indicate the general configuration of the work. All work that will be required for the actual installation is not necessarily indicated due to the scale of the drawings. Coordinate the actual installation of all work with all other building system components and other trades and provide all necessary coordination, offsets, accessories, materials, etc. as part of the work.

1.27 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to Architectural interior and exterior elevations and equipment specifications for rough-in requirements.

1.28 CRANE WORK

A. All crane work shall be coordinated with the owner to minimize building shut-down time. No equipment shall be listed on or off the roof while the building is occupied. Coordinate crane schedule with the owner's schedule. Contractor shall be responsible for all safety enforcement. Visit the site and become fully aware of all crane requirements prior to submitting a bid.

1.29 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of systems, materials, and equipment. Comply with the following requirements:

1. Coordinate systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of systems with utilities and services. Comply with requirements of governing regulations, service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to

arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Design Professional(s).

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors where units are concealed behind finished surfaces.
12. Install materials and equipment firmly supported and secured to the building construction where required, and according to manufacturer's instructions
13. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 23 0010

SECTION 23 0050 – BASIC MATERIALS AND METHODS (MECHANICAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and other Division 22 and 23 Sections.

1.2 SUMMARY

A. This Section includes limited scope general construction materials and methods and common materials for mechanical installations as follows:

1. Common Piping System Requirements
2. Materials and installation
    a. Transition fittings
    b. Dielectric fittings and unions
    c. Solder
3. Miscellaneous metals and lumber.
4. Access panels
5. Painting and finishing
6. Sleeves and seals
    a. Sleeves
    b. Mechanical sleeve seals
    c. Escutcheons
7. Joint sealers
8. Firestop systems
9. Grout
10. Concrete and masonry work
11. Equipment installation requirements.
12. Supports and anchors.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Product Data: For all specified materials and products:

B. Shop Drawings: Detailed fabrication and installation drawings for supports and anchorages.

C. Firestop: For each firestop system show construction conditions, relationships to adjoining construction, dimensions, description of materials, component connections, anchorage methods, hardware and installation procedures, plus the following:

1. Firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that confirms compliance with requirements for each condition.

1.5 PROJECT CONDITIONS

A. Maintain and protect existing building services, which transit the area affected by selective demolition. Provide temporary utility services to affected areas.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, undermining, washout, and other hazards created by excavation operations.

C. Existing Utilities: Locate existing underground utilities near excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.

1. Contact applicable “One-Call Service” and any local utilities not represented by the “One-Call” system.

D. Remove existing underground utilities indicated to be removed.

1. Uncharted or Incorrectly Charted Utilities: Contact utility owner immediately for instructions.
2. Provide minimum of 48-hour notice to owner and/or Architect/Engineer prior to utility interruption.

E. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joints sealer manufacturer. Do not apply joint sealers to wet substrates.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

C. Deliver and store all ductwork so it remains dry and free of any dirt or dust. All ductwork openings, whether in storage or installed prior to system start-up, shall be protected with protective film to prevent interior of ductwork systems from getting dirty. (Trimaco Blue HVAC Film, or equal).

PART 2 - PRODUCTS

2.1 PIPE, TUBE AND FITTINGS

A. Refer to individual piping Sections for application requirements for pipe, tube, and fitting materials and joining methods.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

I. PVC Pipe Adhesive: Lubricate gaskets in accordance with the manufacturer's published installation instructions, using lubricant compatible with the gasket elastomer and fluid media. Basis of Design: Victaulic Vic-Lube.

J. CPVC Pipe Adhesive: As recommended by pipe manufacturer.

2.3 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: (CPVC and PVC) one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC or PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:
   a. NIBCO Inc.
   b. Thompson Plastics, Inc.
   c. Eslon Thermoplastics.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Description: Sleeves

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

B. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

F. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

G. PVC Pipe: ASTM D 1785, Schedule 40.

H. Molded HDPE: Reusable, HDPE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:
   a. Central Plastics Company.
   b. Epco Sales, Inc.
   c. Watts Industries, Inc.; Water Products Div.
   d. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:
   a. Central Plastics Company.
   b. Epco Sales, Inc.
   c. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.

d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
   a. Calpico, Inc.
   b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America.

2.7 MISCELLANEOUS METALS AND LUMBER:

A. Miscellaneous metal shall be as follows:

1. Steel plates, shapes, bars, and bar grating: ASTM A 36.
2. Cold-Formed Steel Tubing: ASTM A 500.
3. Hot-Rolled Steel Tubing: ASTM A 501.
4. Steel Pipe: ASTM A 53, Schedule 40, welded.
5. Fasteners: Zinc-coated, type, grade, and class as required.

B. Miscellaneous lumber shall be as follows:

1. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
2. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.

2.8 ACCESS DOORS

A. Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces. Doors and frames shall be non-rusting aluminum, stainless steel, or galvanized material.

B. Doors and Panels shall be of suitable size and construction for each specific location. Panels to be installed in fired rated ceilings or walls shall have a UL fire rating.

C. Frames: 16-gauge with a ¾" or 1" wide exposed perimeter flange for applications as follows:

1. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors. Milcor M-3202.
2. For gypsum wallboard or plaster: Perforated flanges with wallboard bead. Milcor DW-3203.
3. For full-bed plaster applications: Galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.

D. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism; 16 gauge frame, and 2" of mineral fiber insulation between 20 gauge front & back door panels.

E. Locking Devices: Flush, cylinder locks, all keyed alike; provide 20 keys.

F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bar-Co., Inc.
2. J.L. Industries.
3. Karp Associates, Inc.
4. Milcor
5. Nystrom, Inc.

2.9 JOINT SEALERS

A. Joint fillers and other related materials compatible with each other and with joint substrates under conditions of service and application. Colors shall be as selected by the Architect from manufacturer's standard colors. Provide the following types of joint sealers:

1. Elastomeric Joint Sealers: Provide the following types:
   a. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
   b. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.

c. Available products: Subject to compliance with requirements, products which may be incorporated in the Work include but are not limited to the following:
   1) One-Part, Nonacid-Curing, Silicone Sealant:
      a) “Dow Corning 790”, Dow Corning CO.
      b) “Silglaze N SCS 2501”, General Electric Co.
      c) “Silpruf SCS 2000”, General Electric Co.
   2) One-Part, Mildew-resistant, Silicon Sealant:
      a) “Dow Corning 786”, Dow Corning Corp.
      b) “SCS 1702 Sanitary”, General Electric Co.

2. Acrylic-Emulsion Sealants: One-part, non-sag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.
3. Fire-Resistant Joint Sealant: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
4. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications.

2.10 FIRESTOP SYSTEMS

A. General:

1. Architect/Engineer must approve in writing any alternates to the firestop systems and materials specified herein.
2. Compatibility: Provide firestop systems that are compatible with one another, with the substrates forming openings, and with the items penetrating through the firestop system, under conditions of service and application, as demonstrated by the firestop system manufacturer based on testing and field experience.
3. Accessories: Provide components for each firestop system to install fill materials and to comply with the UL listing. Use only components specified by firestop systems manufacturer and approved by the qualified testing and inspecting agency.
   a. Permanent forming/damming/backing materials
   b. Temporary forming materials.
   c. Substrate primers.
   d. Collars and steel sleeves.
4. Manufacturers; Specified product or equal by
   a. Hilti or
   b. Specified Technologies Inc.
   c. Dow Corning
5. Architect/Engineer must approve in writing any alternates to the firestop systems and materials specified herein

B. Through-Penetration Firestop Systems:

1. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR (firestop devices) and XHEZ (firestop systems) may be used, providing that they conform to the construction type, penetrant, type, annular space requirements and fire rating involved in each separate instance, and that the system is symmetrical for wall applications. Systems or devices must be asbestos-free.
2. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

C. Construction Joint/Gap Firestop Systems:

1. Fill materials listed in the UL Fire Resistance Directory under category XHHW may be used, providing materials conform to the construction type and fire rating involved in each application.
2. Forming materials listed in the UL Fire Resistance Directory under category XHKU may be used, providing material conforms to the construction type and fire rating involved in each application and meets UL 2079 and ASTM E1966.
3. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device and designed to perform this function.

D. Firestop Systems for Cable Trays, Conduits, and Cables.

1. Electrical Systems protection material as listed in UL-classified systems UL 1709, ASTM E119, ASTM E1529 and ASTM E1725.
2. Acceptable products: As listed in the UL Fire Resistance Directory for the applicable UL system.
    a. Fire resistive mats: 3M Interam Endothermic Mats, 0.3” or 0.4” thick foil encapsulated roll product.
    b. Smoke and Flame Sealant: 3M FireDam 150 Caulk.
    c. Foil Tape: 3M Interam T-49 Aluminum Foil Tape; used as a vapor barrier, radiant heat reflector, and installation aid.
    d. General Purpose Tape: Scotch 898 Filament Tape; used as installation aid.
    e. Composite Sheet: 3M Fire Barrier CS-195+ Composite Sheet; used to cover openings and as a collar at the termination of the fire protection envelopes.

E. Firestopping Caulk: 3M Fire Barrier CP 25WB+ Caulk; used as a smoke and flame sealant.

2.11 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.12 CONCRETE

A. Comply with the following as minimums:

1. Air-Entraining Admixture: ASTM C260.
2. Portland Cement: ASTM C150, Type I or II, low alkali.
3. Welded wire fabric shall conform to A.S.T.M. A 185.
4. Reinforcing bars shall conform to A.S.T.M. A 615, Grade 60. Bars shall be deformed billet steel with fiber stress value of 20,000 psi.
5. Aggregate, general:
   a. ASTM C33, uniformly graded and clean.
   b. Do not use aggregate known to cause excessive shrinkage.
6. Aggregate, coarse: Crushed rock or washed gravel with minimum size between ¾" and 1-1/2", and with a maximum size number 4.
7. Aggregate, fine: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen of which at least 12% shall pass a 50-mesh screen.
8. Water: Clean and potable, free of injurious amounts of oil, acid, alkali and organic matter.

B. Class of Concrete

1. Concrete shall develop a minimum compressive strength of 3000 psi in twenty eight (28) days.
2. Ready mixed concrete shall be mixed and delivered in accordance with ASTM C94.

C. Quality Control: Perform sampling and testing during concrete placement, as follows:

1. Sampling: ASTM C.172.
2. Slump: ASTM C 143, one of test for each load at point of discharge
3. Air Content: ASTM C 173, one for each set of compressive strength specimens.
4. Compressive Strength: ASTM C 39, one set for each 50 cu. yds, or fraction thereof of each class of concrete; one specimen tested at seven days, one specimen tested at 28 days, and one retained for later testing if required.
5. When the total quantity of a given class of concrete is less than 50 cu. yds, Architect/Engineer may waive strength tests if field experience indicates evidence of satisfactory strength.

2.13 EARTHWORK

A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve, and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 1 1/2

inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

D. Excavation: As follows:

1. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
2. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
3. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
4. Install sediment and erosion control measures in accordance with local codes and ordinances.
5. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
    a. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
    b. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
    c. Provide pumping of excavation area as required.
6. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
    a. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.
    b. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
7. Excavation for Underground Tanks, Basins, and Mechanical Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
    a. Excavate, by hand, areas within drip-line of large trees. Protect the root system from damage and dry-out. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.
    b. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.
8. Trenching: Excavate trenches for mechanical installations as follows:
    a. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of pipe and equipment.
    b. Excavate trenches to depth indicated or required for piping to establish indicated slope and invert elevations. Beyond building perimeter, excavate trenches to an elevation below frost line.
    c. Limit the length of open trench to that in which pipe can be installed, tested, and the trench backfilled within the same day.

d. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of pipe. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and pipe.
e. Excavate trenches for piping and equipment with bottoms of trench to accurate elevations for support of pipe and equipment on undisturbed soil.
1) For pipes or equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom 1/4 of the circumference. Fill unevenness with tamped sand backfill. At each pipe joint over-excavate to relieve the bell or pipe joint of the pipe of loads, and to ensure continuous bearing of the pipe barrel on the bearing surface.

9. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F.
10. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.
a. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
b. Under building slabs, use drainage fill materials.
c. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
d. For piping less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation and testing of piping, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
e. Other areas use excavated or borrowed materials.
11. Backfill excavations as promptly as work permits, but not until completion of the following:
a. Inspection, testing, approval, and locations of underground utilities have been recorded.
b. Removal of concrete formwork.
c. Removal of shoring and bracing, and backfilling of voids.
d. Removal of trash and debris.
12. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
13. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
14. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of piping and equipment by carrying material uniformly around them to approximately same elevation in each lift.
15. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
a. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in

accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

1) Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
2) Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
3) Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

b. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

16. Subsidence: Where subsidence occurs at mechanical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

E. Definitions: The following definitions apply to excavation operations:

1. Additional Excavations: Where excavation has reached required subgrade elevation, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
2. Subbase: As used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
3. Subgrade: As used in this Section refers to the compacted soil immediately below the slab or pavement system.
4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevation or dimensions without specific direction from the Architect/Engineer.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS – COMMON REQUIREMENTS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

1. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
2. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
3. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to allow application of insulation.
4. Install piping to permit valve servicing.
5. Install piping at indicated slopes and free of sags and bends.
6. Install fittings for changes in direction and branch connections.

B. Select system components with pressure rating equal to or greater than system operating pressure.

C. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New or Existing Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
    g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

D. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

E. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    a. Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

F. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

G. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

H. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

I. Verify final equipment locations for roughing-in.

J. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

K. Install piping so as not to encroach on required clearances above or around electrical panels.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Non-pressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 ACCESS DOOR INSTALLATION

A. Where required, all ceiling and wall access doors (panels) shall be furnished by this Contractor and set by this Contractor. The location of these access panels must be approved by the Architect prior to their installation. Provide an access panel where valves, dampers, and other serviceable items are installed behind plaster, tile, or similar type non-removable surfaces.

B. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Do not located valves, actuators or any items requiring access in an inaccessible location unless an approved access door is provided.

3.5 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 EARTHWORK

A. Provide all labor, equipment and services required for underground or underslab mechanical or plumbing systems excavation and backfill. Coordinate work with the work of other trades.

B. Perform excavation and trenching as follows:

1. Shoring and Bracing: Shore and brace as required for stability of excavation and to comply with local codes and authorities. Slope sides of excavations to comply with local codes and ordinances. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

2. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
3. Install sediment and erosion control measures in accordance with local codes and ordinances.
4. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
    a. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
    b. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
    c. Provide pumping of excavation area as required.
5. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
    a. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.
    b. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
6. Excavation for Underground Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
    a. Excavate, by hand, areas within drip-line of large trees. Protect the root system from damage and dry-out. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.
    b. Do not disturb bottom of excavation. Excavate by hand to final grade before concrete reinforcement is placed.
7. Trenching: Excavate trenches as follows:
    a. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of installed materials.
    b. Excavate trenches to depth indicated or required.
    c. Limit the length of open trench to that in which piping can be installed, and the trench backfilled within the same day.
    d. Where rock is encountered, carry excavation below required elevation and backfill with a layer of select fill or sand prior to installation of piping. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and installed materials.
8. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F (1 deg C).

C. Perform backfilling as follows:

1. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

a. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
b. Under building slabs, use drainage fill materials.
c. Under raceways and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
d. For raceway less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. Provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
e. Other areas use excavated or borrowed materials.

2. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Inspection, testing, approval, and locations of underground utilities have been recorded.
   b. Removal of concrete formwork.
   c. Removal of shoring and bracing, and backfilling of voids.
   d. Removal of trash and debris.
3. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
4. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, raceways, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
6. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
   a. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
      1) Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
      2) Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
      3) Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

b. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

7. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.7 ANCHORS

A. Direct all piping motion to expansion joints by heavy clamps and/or structural steel sections clamped or welded to structural members as required and/or as indicated. Points at which anchors are located and secured shall be approved by the Architect/Engineer such that no structural members shall be unduly strained. Where possible, anchor points shall be on members running parallel to the piping being anchored.

3.8 CONCRETE WORK

A. Provide all labor, equipment and services required for indoor and/or outdoor concrete work related to electrical installations in conformance with ACI (American Concrete Institute) guidelines and practices.

B. Coordinate work with the work of other trades. Prior to installing any forms, reinforcing or concrete, notify trades in ample time for them to install any portion of their work which is to be concealed in the concrete. No such work shall be placed in a manner to interfere with the proper placing of the reinforcement unless so authorized by the Architect/Engineer.

3.9 CONCRETE BASES AND ANCHOR BOLTS

A. Verify the location of all anchor bolts for the equipment furnished and supervise the work while foundations, bases, or curbs are poured.

B. Concrete Bases: Anchor equipment to new or existing concrete base or substrate as indicated, according to equipment manufacturer's written instructions.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.
2. New Concrete Base: Pour new base integral with new floor slab, or else roughen existing concrete surface and install dowel rods on 18-inch centers around the full perimeter of the base, unless otherwise indicated, to connect new concrete base to new or existing concrete floor. Use L-hook type anchor bolts imbedded the full slab depth.
3. Existing Base: For equipment installation on existing concrete floors or bases, install epoxy-coated anchor bolts that extend through and anchor into existing structural concrete floor or base. Install epoxy-type anchor bolts according to anchor-bolt manufacturer's written instructions.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout. Place grout, completely filling equipment bases. Place grout on concrete bases and provide smooth bearing surface for equipment. Place grout around anchors.

E. Cure placed grout

3.11 ERECTION OF SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.

B. Field Welding: Comply with AWS D1.1.

C. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor materials and equipment.

D. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

E. Attach to substrates as required to support applied loads.

3.12 FIRESTOP SYSTEMS

A. Examination:

1. Examine areas and conditions under which firestop system is to be installed and notify the architect of conditions detrimental to proper or timely completion of the work.
2. Examine substrates to determine they are satisfactory to receive firestop system materials.
    a. Conduct tests according to firestop systems manufacturer’s written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fire-resistive materials.
    b. Verify objects penetrating firestop materials, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

c. Verify substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive materials.

3. Verify that environmental conditions are safe and suitable for installation of firestop materials.
4. Do not proceed with installation of firestop system until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the Architect.

B. Preparation:

1. Clean and repair substrates that could impair the adhesion or proper fitting of firestop materials, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
2. Secure all pipe, conduit, cable and other items which penetrate firestop materials.
3. Provide masking and temporary covering, as required, to prevent contamination of adjacent surfaces by firestop materials.

C. Installation – General

1. Installation of firestop systems shall be performed in strict accordance with manufacturer's detailed installation instructions and procedures.
2. Extend firestop material in full thickness over entire area of each substrate or opening to be protected.
3. Protect firestop material from damage on surfaces subject to traffic.

D. Installation of Through–Penetration Firestop Systems

1. General
   a. Install through–penetration firestop systems to comply with firestop systems manufacturer's written installation instructions and published drawings for products and applications indicated.
   b. Install forming/damming/backing materials and other accessories of types required to support fill material during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
      1) After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.
   c. Install fill materials for firestop systems by proven techniques to produce the following results.
      1) Fill voids and cavities formed by openings, forming materials, accessories and penetrating items as required too achieve fire-resistance ratings indicated.
      2) Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
      3) For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining surfaces.
2. Field Quality Control

a. Proceed with enclosing through-penetration firestop systems with other construction only after inspection and approval by code authorities.
b. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
c. Inspection Agency: If required, owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports indicating whether through-penetration firestop systems comply with or deviate from requirements.

3. Identification
   a. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
      1) The words: “Warning-Through-Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage”.
      2) Contractor’s name, address and phone number.
      3) Through-penetration firestop systems designation of applicable testing and inspecting agency.
      4) Date of installation.
      5) Through-penetration firestop system manufacturer’s name.
      6) Installer’s name.
4. Cleaning and Protection
   a. Clean off excess fill materials adjacent to openings as work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop systems manufacturer and that do not damage materials in which openings occur.
   b. Provide Final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 23 0050

SECTION 23 0090 - REMOVALS AND DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes requirements for demolition and removals of mechanical systems and portions of the same.

B. The Drawings are drawn to generally indicate the demolition required to accommodate the new construction but are not all inclusive. The full extent of demolition work must be determined in the field based on the actual conditions encountered and as required for the satisfactory provision and proper execution of the work. It is the responsibility of the General Contractor to coordinate the scope of work for each subcontractor.

1.3 DESCRIPTION OF WORK

A. This Contractor shall be responsible for the removal of existing piping, ductwork, wiring, conduit, insulation, supports, and equipment in the existing building which is noted or shown on the Drawings or which is in conflict with the new construction or new mechanical systems. Remove all associated appurtenances such as hangers, insulation, sleeves, supports, roof curbs. Remove all associated controls including any pneumatic tubing (if applicable) and wiring back to its source. Existing piping, equipment and ductwork which are removed shall be disconnected at their source and capped. Furnish all labor, equipment hauling, rigging, scaffolding, etc. necessary for the removal phase of the project.

B. Cut and cap ends of existing piping systems which must remain active throughout later phases of construction and where portions of existing systems are shown on the Drawings to remain. Remove as indicated on the plans existing piping or ductwork back to the point of re-construction.

C. Where existing piping, ductwork, wiring, or equipment must be removed to install new systems and these systems must also remain operational because of phasing, the contractor shall provide temporary piping, ductwork, wiring, and equipment for the remainder of the construction phasing. Install new systems as much as possible before removing existing to minimize down time. Down time of utilities shall be done off hours to minimize Owner disruption.

D. Where existing piping, ductwork, or wiring is to be removed for upgrading and existing systems are connected to the systems being removed the existing shall be reconnected to the new to maintain services.

E. Temporary piping, ductwork, control wiring, and wiring is not necessarily shown on the drawings. It is up to the contractor to determine the best method of making temporary connections to maintain existing system operation.

1.4 CUTTING AND PATCHING

A. Cutting and patching shall be by this Contractor unless otherwise indicated. Patch existing wall, roof, and floor openings after removing HVAC equipment, piping, and ductwork. Patching shall match existing materials and methods of construction. Patching of walls and roofs shall be performed in a manner to maintain structural integrity and to the satisfaction of the Architect. Patch and repair any spray on fire proofing required because of removal of ductwork, piping, wiring, or equipment.

1.5 OWNERSHIP

A. The Owner shall have the option of keeping any or all salvageable items removed from building such as plumbing fixtures, mechanical equipment, controls, pipe, etc. Any items removed from the building that Owner does not wish to keep shall become the property of this Contractor and he shall dispose of these items in a legal landfill. Prior to removing any materials or equipment, the Contractor shall review with the Owner which materials or equipment the owner chooses to retain; the Contractor shall proceed to remove claimed equipment with extreme care so as not to damage the equipment or material.

B. Provide notarized certification that disposal of materials resulting from demolition operations has been accomplished in conformance with all pertinent requirements and regulations of governmental agencies having jurisdiction.

PART 2 - PRODUCTS: (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Disconnect and remove all material, piping, equipment, supports, wiring, etc made obsolete by the renovations.

B. Should the contractor encounter a material, during the progress/demolition on this project they suspect may contain asbestos, and the material must be removed or penetrated to accommodate the new construction, the Contractor shall immediately notify the Owner and Architect in writing before any work on the material is performed. The Owner will have the material tested and have it removed if the test results warrant it.

C. Materials resulting from demolition and removal operations shall become the property of the Contractor and shall be completely removed from the site unless noted otherwise on the drawings or requested by the Owner.

D. Storage of debris and other materials resulting from demolition operations shall not be permitted to be stored on site, unless noted otherwise.

E. When an existing item is removed, the contractor shall also remove the accompanying sealant, supports, and all anchors. All sealant residues shall be completely removed and the walls cleaned and repaired to match adjacent wall surfaces.

F. All extraneous items not required or needed in the renovated areas (i.e., dead thermostats, dead electric outlets, switches, conduits, wiring, ductwork, piping, equipment, controls, outlets, grilles, etc.) shall be removed by the respective contractors and the surfaces patched to match the adjacent existing and/or new finishes.

G. Contractors to protect all floors, walls, ceilings, and furnishings throughout the demolition area. Any damage to the area as a result of demolition shall be fixed to match existing conditions at no extra cost to the Owner.

H. Where equipment or piping is removed, and holes or marked surfaces are left in the walls or ceiling they shall be patched to match the existing surface. The entire wall or ceiling shall then be painted in a color to match the original color. Painting material and methods shall be as specified in the project specifications.

I. It may be necessary for the contractor to temporarily remove, store, and reinstall ceiling tiles as required to access piping, equipment, and conduit in the ceiling space or to install new. The contractor is responsible for damage to the ceiling tiles. Tiles or grid damaged by this contractor shall be replaced with new by this contractor. The contractor shall document areas of the ceiling removed by his workers

J. The contractor shall assume full responsibility for draining and containing existing glycol-based hydronic systems which are indicated for demolition. Furthermore, the contractor shall assume full responsibility for removing this water/glycol solution from the project site and dispose in accordance with all state and federal regulations at no additional cost to the owner.

END OF SECTION 23 0090

SECTION 23 0529 - HANGERS AND SUPPORTS FOR MECHANICAL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:
1. Division 23 Section(s) "Metal and Nonmetal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Pipe positioning systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. National Pipe Hanger Corporation.
2. B-Line Systems, Inc.; a division of Cooper Industries.
3. Carpenter & Paterson, Inc.
4. Empire Industries, Inc.
5. ERICO/Michigan Hanger Co.
6. Grinnell Corp.
7. MIRO Industries
8. Pipe Shields, Inc.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped. All metal to be galvanized.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Coatings: Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Insulation-Insert Material for Hot Water Piping: Water-repellent treated, Type I cellular glass or calcium silicate with vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. Masterset Fastening Systems, Inc.
   d. MKT Fastening, LLC.
   e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
   a. B-Line Systems, Inc.; a division of Cooper Industries.
   b. Empire Industries, Inc.
   c. Hilti, Inc.
   d. ITW Ramset/Red Head.
   e. MKT Fastening, LLC.
   f. Powers Fasteners.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted and floor mounted piping.

B. Low-Type, Single-Pipe Stand: One-piece UV resistant polycarbonate resin base unit with plastic roller. Provide each support with 100% recycled rubber support pad between support and roof. Provide each support with RAH pipe guide accessory.

1. MIRO Industries: Model 4-RAH-14; Maximum Pipe Outside Diameter = 4”; Maximum spacing at 8’-0”

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT PROJECT SPECIFIC REQUIREMENTS

A. Refer to individual piping specifications for specific requirements of the type of hangers and supports to utilize.

3.2 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Galvanized Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 and larger.
2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 to allow off-center closure for hanger installation before pipe erection.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
4. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 and larger.

5. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange.
6. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
7. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 and larger, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
8. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 and larger, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
9. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 and larger, from single rod if horizontal movement caused by expansion and contraction might occur.
10. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 and larger, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
11. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 and larger, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
12. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 and larger, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 and larger.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 and larger, if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

M. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.3 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attaching clamps and spacers to piping and insulation.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert. Maintain continuous insulation and vapor barrier.
   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.4 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.7 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 0529

SECTION 23 0553 - IDENTIFICATION FOR MECHANICAL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes mechanical identification materials and devices.

1.3 SUBMITTALS

A. Product Data: For identification materials and devices.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with ASME A13.1, “Scheme for the Identification of Piping Systems” for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 IDENTIFYING DEVICES AND LABELS

A. General: Products specified are for applications referenced in other Division 23 Sections. If more than a single type is specified for listed applications, selection is Installer’s option. Subject to compliance with requirements, manufacturers offering mechanical identification materials which may be incorporated in the work include but not limited to, the following:

1. Seton Name Plate Co. 800-243-6624

2. National Marker Co. 800-453-2727
3. Marking Services, Inc. 800-234-0135

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data:
   a. Equipment ID Designator (corresponding to Drawing designations)
   b. Manufacturer,
   c. Model number
   d. Serial number
   e. Voltage/Phase
   f. Feeder Panel Designation / Circuit ID
   g. Date of Installation
2. Location: Accessible and visible. For exterior-mounted equipment, locate on north side of equipment.

C. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semi-rigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

1. Acceptable Product: www.seton.com; Seton Identification Products "Set Mark".

D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color coded, pressure-sensitive, vinyl type with permanent adhesive.

1. Acceptable Product: www.seton.com; Seton Identification Products "Opti-Code".

E. Pipes with OD, Including Insulation, Less than 6 inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 inches and larger: Either full-band or strip-type pipe markers, at least 3 times letter height and of length required for label.

G. Lettering: Manufacturer's standard preprinted captions as selected by Engineer.

1. Arrows: Either integrally with piping system service lettering, to accommodate both directions, or as separate unit, on each pipe marker to indicate direction of flow.

H. Plastic Duct Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cold-air supply.
2. Yellow: Hot-air supply.
3. Blue: Exhaust, outside, return, and mixed air.
4. Hazardous Material Exhausts: Use colors and designs recommended by ASME A13.1.
5. Terminology: Include direction of airflow; duct service such as supply, return, and exhaust; duct origin, duct destination, and design airflow.

Acceptable Product: www.seton.com; Seton Identification Products “Seton Code Markers - Duct”.

I. Valve Tags: Engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
2. Size: 1-1/2-inches diameter, unless otherwise indicated.

Acceptable Product: www.seton.com; Seton Identification Products “Style No. 31496”

J. Valve Tag Fasteners: Plastic cable tie.

K. Access Panel Markers: 1/16-inch- thick, engraved plastic-laminate markers, with abbreviated terms, and numbers corresponding to concealed valve. Provide pressure-sensitive permanent adhesive backing.

1. Acceptable Product: www.seton.com; Seton Identification Products “Opti-Code”

L. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver’s standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/16 inch, for units up to 20 sq. in or 8 inches in length, and 1/8 inch for larger units.
3. Fasteners: stainless-steel screws or contact-type, permanent adhesive.

Acceptable Product: www.seton.com; Seton Identification Products “Engraved Data Name Plates”.

M. Plastic Equipment Markers: Manufacturer’s standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: use colors and designs recommended by ASME A 13.1.
6. Terminology: Match schedules as closely as possible. Include the following:
   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

N. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABELING AND IDENTIFYING PIPING SYSTEMS

A. Install pipe markers on each system. Include arrows showing normal direction of flow.

B. Marker Type: Plastic markers, with application systems. Install on pipe insulation segment where required for hot, non-insulated pipes.

C. Fasten markers on pipes and insulated pipes smaller than 6 inches OD by one of the following methods.

1. Snap-on application of pre-tensioned, semi-rigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe or insulation.
4. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 3/4 inch wide, lapped a minimum of 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

D. Fasten markers on pipes and insulated pipes 6 inches in diameter and larger by one of following methods:

1. Laminated or bonded application of pipe marker to pipe or insulation.
2. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 1-1/2 inches wide, lapped a minimum of 3 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Strapped to pipe or insulation with manufacturer’s standard stainless-steel bands or plastic cable ties.

E. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations according to the following:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for terminal units. Mark each pipe at branch, where flow pattern is not obvious.
3. Near penetrations through walls, floors, ceilings, or non-accessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaces at a maximum of 25-foot intervals along each run. Reduce intervals to 15 feet in area of congested piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units. Indicate valve tag numbers on the as-built drawings.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme.

C. Tag Material: Plastic

3.4 EQUIPMENT SIGNS AND MARKERS

A. Install engraved plastic-laminate signs or equipment markers on or near each major item of mechanical equipment. Include signs for the following general categories of equipment:

1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
2. Fuel-burning units, including water heaters, boilers, furnaces, and heaters.
3. Compressors, condensers, and similar motor-driven units.
4. Heat exchangers, coils, and similar equipment.
5. Fans, blowers, primary balancing dampers, and mixing boxes.
6. Packaged HVAC central-station and zone-type units.
7. Tanks and pressure vessels.
8. Humidifiers, water-treatment systems, and similar equipment.
9. Lettering Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
10. Terms on Signs: Distinguish between multiple units, indicate operational requirements, indicate safety and emergency precautions, war of hazards and improper operations, and identify units.

B. Duct Systems: Identify air supply, return, and exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows showing service and direction of flow.

1. Location: Locate signs near points where ducts enter into concealed spaces and at maximum intervals of 25 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 ADJUSTING AND CLEANING

A. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

B. Clean faces of identification devices.

END OF SECTION 23 0553

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:
   a. Constant-volume air systems.
2. Hydronic Piping Systems:
   a. Constant-flow systems.
3. HVAC equipment quantitative-performance settings.
4. Space pressurization testing and adjusting.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

F. Report Forms: Test data sheets for recording test data in logical order.

G. Smoke-Control Zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.

H. Stair Pressurization System: A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.

I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

M. TAB: Testing, adjusting, and balancing.

N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

O. Test: A procedure to determine quantitative performance of systems or equipment.

P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 90 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit three copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC, NEBB, or TABB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives; HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. The Contract Documents examination report.
c. TAB plan.
d. Work schedule and Project-site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems". NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification".

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's, NEBB or TABB forms stating that AABC, NEBB or TABB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine strainers for clean screens and proper perforations.

N. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

O. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

P. Examine system pumps to ensure absence of entrained air in the suction piping.

Q. Examine equipment for installation and for properly operating safety interlocks and controls.

R. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multi-zone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

S. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing"] and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer. If design airflow cannot be obtained with the installed sheaves and belts they shall be replaced with a set that will allow proper speed adjustments.

1. Measure fan static pressures to determine actual static pressure as follows:
    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur.

Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
   a. Where sufficient space in sub-main and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
2. Re-measure each sub-main and branch duct after all have been adjusted. Continue to adjust sub-main and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.

7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.8 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.9 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.10 PROCEDURES FOR BOILERS

A. If hydronic, measure entering- and leaving-water temperatures and water flow.

B. If steam, measure entering-water temperature and flow and leaving steam pressure, temperature, and flow.

3.11 PROCEDURES FOR HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.

6. Fuse or circuit-breaker rating for overload protection.

C. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.12 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or non-grounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.13 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.14 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.15 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
    j. Number of belts, make, and size.
    k. Number of filters, type, and size.
2. Motor Data:
    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg .
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Filter static-pressure differential in inches wg.
    f. Cooling coil static-pressure differential in inches wg.
    g. Heating coil static-pressure differential in inches wg.
    h. Outside airflow in cfm.
    i. Return airflow in cfm.
    j. Outside-air damper position.
    k. Return-air damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:
    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch o.c.
    f. Make and model number.
    g. Face area in sq. ft.
    h. Tube size in NPS.
    i. Tube and fin materials.
    j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
    a. Airflow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in inches wg.
    d. Outside-air, wet- and dry-bulb temperatures in deg F.
    e. Return-air, wet- and dry-bulb temperatures in deg F.
    f. Entering-air, wet- and dry-bulb temperatures in deg F.
    g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.
    j. Entering-water temperature in deg F.
    k. Leaving-water temperature in deg F.
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig.
    n. Refrigerant suction temperature in deg F.

H. Gas- Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:
    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.

f. Fuel type in input data.
g. Output capacity in Btuh (kW).
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btuh (kW).
i. High-fire fuel input in Btuh (kW).
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btuh (kW).
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btuh (kW).

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:
a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.

c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
   a. System and air-handling unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F.
   d. Duct static pressure in inches wg.
   e. Duct size in inches.
   f. Duct area in sq. ft.
   g. Indicated airflow rate in cfm.
   h. Indicated velocity in fpm.
   i. Actual airflow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Test apparatus used.
   d. Area served.
   e. Air-terminal-device make.
   f. Air-terminal-device number from system diagram.
   g. Air-terminal-device type and model number.
   h. Air-terminal-device size.
   i. Air-terminal-device effective area in sq. ft.
2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Air velocity in fpm.
   c. Preliminary airflow rate as needed in cfm.
   d. Preliminary velocity as needed in fpm.
   e. Final airflow rate in cfm.
   f. Final velocity in fpm.
   g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Room or riser served.
   d. Coil make and size.
   e. Flowmeter type.
2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

M. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors or air-cooled condensing units, include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Unit make and model number.
   d. Compressor make.
   e. Compressor model and serial numbers.
   f. Refrigerant weight in lb.
   g. Low ambient temperature cutoff in deg F.
2. Test Data (Indicated and Actual Values):
   a. Entering-air, dry-bulb temperature in deg F.
   b. Leaving-air, dry-bulb temperature in deg F.
   c. Control settings.
   d. Unloader set points.
   e. Low-pressure-cutout set point in psig.
   f. High-pressure-cutout set point in psig.
   g. Suction pressure in psig.
   h. Suction temperature in deg F.
   i. Condenser refrigerant pressure in psig.
   j. Condenser refrigerant temperature in deg F.
   k. Oil pressure in psig.
   l. Oil temperature in deg F.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Kilowatt input.
   p. Crankcase heater kilowatt.
   q. Number of fans.
   r. Condenser fan rpm.
   s. Condenser fan airflow rate in cfm.
   t. Condenser fan motor make, frame size, rpm, and horsepower.
   u. Condenser fan motor voltage at each connection.
   v. Condenser fan motor amperage for each phase.

N. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model and serial numbers.

f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):
   a. Static head in feet of head or psig.
   b. Pump shutoff pressure in feet of head or psig.
   c. Actual impeller size in inches.
   d. Full-open flow rate in gpm.
   e. Full-open pressure in feet of head or psig.
   f. Final discharge pressure in feet of head or psig.
   g. Final suction pressure in feet of head or psig.
   h. Final total pressure in feet of head or psig.
   i. Final water flow rate in gpm.
   j. Voltage at each connection.
   k. Amperage for each phase.

O. Instrument Calibration Reports:

1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.16 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Measure sound levels at two locations.
   e. Measure space pressure of at least 10 percent of locations.
   f. Verify that balancing devices are marked with final balance position.
   g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.17 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 0593

SECTION 23 0700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Flexible Elastomeric.
   b. Mineral fiber board and blanket.
2. Insulating cements.
3. Adhesives.
4. Sealants.
5. Mastics.
6. Field-applied jackets.
7. Tapes.

B. Related Sections:
1. Division 23 Section "Metal [and Nonmetal] Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. General Requirements:

1. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. If applicable, products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

4. If applicable, insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

B. Flexible Elastomeric (Piping): Expanded flexible elastomeric closed-cell foam tubular materials with manufactured pre-slit and self-sealing closure system complying with ASTM C 534, type 1, Grade 1.

1. Products: Subject compliance with requirements, provide from the following or approved equal.
   a. Armacell LLC.
   b. K-Flex USA.
2. Acceptable Product: www.armacell.com Armacell LLC, Model “SS Self-Seal Pipe Insulation”.

C. Flexible Elastomeric (Equipment): Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide from one of the following:
   a. Aeroflex USA Inc.
   b. Armacell LLC.
   c. K-Flex USA.
   d. RBX Corporation.
2. Acceptable Product: www.armacell.com Armacell LLC Model “AP Armaflex”.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide from one of the following:
   a. CertainTeed Corp.
   b. Johns Manville.
   c. Knauf Insulation.
   d. Owens Corning.
2. Acceptable Product: www.knaufusa.com Knauf Insulation Model “Duct Wrap”

E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide from one of the following:
   a. CertainTeed Corp.
   b. Fibrex Insulations Inc.
   c. Johns Manville.
   d. Knauf Insulation.
   e. Owens Corning.

2. Acceptable Product: www.knaufusa.com Knauf Insulation Model “Insulation Board.”

F. Rigid Foam Board: Closed cell polyisocyanurate foam panel.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow: THERMAX™ Heavy Duty Insulation.
   b. Carlisle HP-CG.
2. Top panel to slope for drainage.
3. ASTM C1289 Type I, Class 2. Meets IBC/IRC requirements for foam plastic insulation. See ICC-ES NER-681. FM 4880 - see Factory Mutual Approval Guide. UL Classified, see Classification Certificate 1256. Calif. Std. Reg. # CA T383
4. Glass-fiber reinforced polyisocyanurate foam core faced with 4.0 mil embossed white acrylic-coated aluminum on one side and 1.25 mil embossed aluminum on the other side.
5. Minimum R value 6.0 per inch.
6. Fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Fibrex Insulations Inc.
   b. Johns Manville.
   c. Knauf Insulation.
   d. Owens Corning.
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. On cold systems, vapor barrier performance is extremely important. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. If humidities in excess of 90% are expected, the ASJ shall be protected with either a mastic coating or a suitable vapor retarding outer jacket. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.
4. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of fiberglass pipe insulation, pipe and tank Insulation, blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers. PVC shall be rated for 25/50 flame/smoke spread rating. Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with suitable weather or vapor resistant mastic as dictated by the system location and service. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access. On cold systems, particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. All

valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion.

5. Acceptable Product: www.knaufusa.com Knauf Insulation Model “1000 Pipe Insulation”.

H. Flexible Valve Wraps: Where cold or chilled water piping is insulated, valves, controls valves, strainers, sensors, etc shall be insulated with a flexible insulation system such as “NOSWEAT” reusable valve wraps (www.ValveWraps.com) or equal. Wrap to be 1” thick fiberglass blanket insulation encapsulated by Tyvek and coated with a polyethylene. Stretch over fittings and seal with Velcro closure. The outer barrier material shall be impermeable to water and water vapor transmission based on ASTM E96 of 0.01 perms. Flame spread 25 or less, Smoke developed 50 or less.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated. Refer to insulation manufacturers specifications for appropriate adhesives to utilize.

2.3 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.

B. FSK, ASJ and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. FSK Jacket Color: Aluminum.
5. ASJ Jacket Color: White.

C. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

D. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of

a rubberized bituminous resin on a crosslaminated polyethylene film covered with aluminum-foil facing. Acceptable Products:

1. www.polyguardproducts.com Polyguard Model “Alumaguard”.
2. www.flexclad.com MFM Building Products “FlexClad”.

2.4 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Thickness: 3.7 mils.
2. Adhesion: 100 ounces force/inch in width.
3. Elongation: 5 percent.
4. Tensile Strength: 34 lbf/inch in width.

2.5 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2. Childers Products, Division of ITW; CP-35.
   a. Foster Products Corporation, H. B. Fuller Company; 30-90.
   b. Marathon Industries, Inc.; 590.

3. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
4. Service Temperature Range: Minus 20 to plus 180 deg F.
5. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
6. Color: White.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.
   b. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
   c. Vimasco Corporation; Elastafab 894.
   d. Childers Products, Division of ITW; Chil-Glas No. 5.

2.7 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, wide with wing seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

C. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel, or 0.062-inch soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

B. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs.

D. Install multiple layers of insulation with longitudinal and end seams staggered.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping".

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or

union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches; space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.9 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
   a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two locations for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect field-insulated equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two locations for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
10. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1. If duct liner does not meet the minimum requirements stipulated with the energy code and ASHRAE/IESNA 90.1, additional exterior insulation shall be provided.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.
7. Nameplates and data plates.
8. Testing agency labels and stamps.

3.12 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Supply and the return air ducts on the warm side of the building insulation.

1. Material: Mineral-fiber blanket.
2. Thickness: R-5.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Supply and the return air ducts in cold areas such as attics and crawl spaces.

1. Material: Mineral-fiber blanket.
2. Thickness: R-8.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

C. Service: Outside-air ducts the warm side of the building insulation

1. Material: Mineral-fiber blanket.
2. Thickness: R-5.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

D. Service: Exhaust Air and Relief Air ducts between the motorized damper and outside termination point. (concealed)

1. Material: Mineral-fiber blanket.
2. Thickness: R-8.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

E. Service: Exhaust Air and Relief Air ducts between the motorized damper and outside termination point. (exposed to view)

1. Material: Mineral-fiber board.

2. Thickness: R-8.
3. Number of Layers: One.
4. Field-Applied Jacket: Woven Glass-Fiber Fabric with white mastic coating.
5. Vapor Retarder Required: Yes.

F. Service: Supply-air ducts, exposed in mechanical rooms, the warm side of the building insulation.

1. Material: Mineral-fiber board.
2. Thickness: R-5.
3. Number of Layers: One
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

G. Service: Return-air ducts, exposed in mechanical rooms.

1. Material: Mineral-fiber board.
2. Thickness: R-5.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

H. Service: Outside-air ducts, exposed in mechanical rooms.

1. Material: Mineral-fiber board.
2. Thickness: R-8.
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

3.13 PIPE INSULATION

A. Field-applied pipe jacket: Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.14 PIPE INSULATION APPLICATION SCHEDULE

A. Service: Domestic cold, hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F.
2. Insulation Material: Glass Mineral Wool with jacket.
3. Insulation Thickness: Apply the following insulation thicknesses:
    a. Piping 1-1/2" and less – 1" thick.
    b. Piping 2" and up – 1-1/2" thick.

4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Rainwater conductors.

1. Insulation Material: Glass Mineral Wool with jacket.
2. Insulation Thickness: Apply the following insulation thicknesses:
3. Field-Applied Jacket: Foil and paper.
    a. Pipe 2" to 4" – 1" thick.
    b. Pipe 5" to 8" – 1½" thick.
4. Vapor Retarder Required: Yes.

Finish: None.

C. Service: Roof drain bodies.
1. Operating Temperature: 32 to 100 deg F.
2. Insulation Material: Glass Mineral Wool with jacket.
3. Insulation Thickness: 2".
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.
6. Finish: None.

D. Service: Condensate drain piping.

1. Operating Temperature: 35 to 75 deg F.
2. Insulation Material: Glass Mineral Wool with jacket or Flexible elastomeric (piping).
3. Insulation Thickness: 1".
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

E. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 150 deg F.
2. Insulation Material: Glass Mineral Wool with jacket or Flexible elastomeric (piping).
3. Insulation Thickness: Apply the following insulation thicknesses:
    a. Piping 7/8" and less – ½" thick.
    b. Piping 1" to 1½" - 1" thick.
    c. Piping 2" to up" – 1" thick
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: Provide PVC jacketing to protect exterior insulation from sun's UV.

F. Service: Heating hot-water supply and return.

1. Operating Temperature: 100 to 200 deg F.
2. Insulation Material: Glass Mineral Wool with jacket.
3. Insulation Thickness: Apply the following insulation thicknesses:
   a. Piping 1-1/2" and less – 1 1/2" thick.
   b. Piping 2" to 4" – 2" thick.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: No.
6. Finish: None.

3.15 PIPING EXPOSED TO WEATHER

A. Piping located outdoors and exposed to the weather shall be insulated as indicated above except the thickness shall be determined according to the worst weather extremes expected. The insulation shall then be protected with one of the following weatherproof finishes as indicated on contract drawings:

1. UV resistant PVC jacketing may be applied in lieu of metal jacketing provided jacketing manufacturer's limitations with regard to pipe size, surface temperature, and thermal expansion and contraction are followed.
2. Fittings shall be insulated as prescribed above, jacketed with preformed fitting covers matching outer jacketing used on straight pipe sections, with all joints weather sealed.
3. On outdoor chilled water and refrigerant lines, the insulation system shall be completely vapor sealed before the weather-resistant jacket is applied. The outer jacket shall not compromise the vapor barrier by penetration of fasteners, etc. Vapor stops at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

3.16 EXPOSED PIPING JACKET

A. Where indicated on the drawing, provide a complete PVC jacket around the entire pipe to protect the insulation. Utilize high-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

3.17 VALVES, CONTROL VALVES, STRAINERS, TRIM

A. Where cold water piping is insulated, valves, controls valves, strainers, sensors, etc shall be insulated with a flexible insulation system such as "NOSWEAT" reusable valve wraps (www.ValveWraps.com) or equal. Wrap to be 1" thick fiberglass blanket insulation encapsulated by Tyvek and coated with a polyethylene. Stretch over fittings and seal with Velcro closure. The outer barrier material shall be impermeable to water and water vapor transmission based on ASTM E96 of 0.01 perms. Flame spread 25 or less, Smoke developed 50 or less.

END OF SECTION 23 0700

SECTION 23 0900 – AUTOMATIC TEMPERATURE CONTROL

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. The Drawings and the General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1 - General Requirements, apply to work specified in this section.

B. Section 23 0901 ATC Sequence of Operations

C. Project Document Review

1. The BMS contractor (BMSC) shall familiarize himself with the terms of the documents and any sections hereinafter referred to that affect this work. If the BMSC believes there are conflicts or missing information in the project documents, the BMSC shall promptly request clarification and instruction from the project engineer.

1.2 BUILDING MANAGEMENT SYSTEM DESCRIPTION

1. A central station Building Management System- BMS is not included in this project.

B. Project Drawings and Specifications

1. The work of the single BMSC shall be as defined individually and collectively in all Sections of this Division's specifications together with the associated project drawings and the associated interfacing work as referenced in the related documents.
2. The project BMS diagrams and drawings are diagrammatic only and shall not be utilized for installation configuration or mounting.

C. Conflict of Codes

1. If any codes conflict, the most restrictive shall apply. Nothing in this specification or related documentation shall be construed to permit work not conforming to applicable codes.

D. BMSC Responsibility

1. The BMSC shall be responsible for mounting and wiring of field installed controls provided with the equipment package.
2. For equipment not provided with DDC controllers, the BMSC shall be responsible for supplying, mounting and wiring of field installed controls.

1.3 SPECIFICATION NOMENCLATURE & DEFINITIONS

A. Singular usage

1. The use of words in the singular in this Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.
2. Acronyms may be used in describing the work of this Division, any additional unique acronyms shall be declared throughout the specifications.

B. Interpretation Aid

1. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds, and other symbolic interpretation aids included in this Division documents are for general information only and are to assist in the reading and interpretation of these Documents.
2. Numerical figures are positive unless otherwise indicated as negative or minus.

C. Definitions

1. Actuator
   a. A control device that opens or closes valve or damper in response to control signal.

D. Acronyms

1. Acronyms may be used in describing the work of this Division, any additional acronyms shall be declared throughout the specifications:
2. Organization and project entities abbreviations
   a. ATC - Automatic Temperature Controls
   b. ASHRAE American Society of Heating, Refrigeration & AC Engineers
   c. BMSC - Building Management System Contractor
   d. BMS - Building Management System
   e. DDC Direct Digital Controller, synonymous with Controller
   f. MC - Mechanical Contractor
   g. UM - Unit Manufacturer, Equipment
3. Direct Digital Controls abbreviations
   a. AI / AO - Analog Input / Analog Output
   b. CI / CO - Configurable Input / Configurable Output
   c. DI / DO - Digital Input / Digital Output
   d. DDC - Direct Digital Control
   e. I/O - Input / Output point
   f. NO / NC - Normally Open / Normally Closed
4. Field Devices Abbreviations
   a. 2W / 3W - 2 Way or 3 way
   b. CS - Current Switch (Binary)
   c. CV - Flow Coefficient of a Control Valve
   d. ES - End Switch
   e. LLS - Low Limit Temperature Switch
   f. M - Actuator, Electronic
   g. MS - Motor Starter
   h. PDS - Pressure Differential Switch (Binary)
   i. R - Control Pilot Relay
   j. SD - Smoke Detector or Smoke Damper

k. TS - Temperature Sensor (Analog)
l. SCV - Self-Contained Control Valve
m. V - Valve, Temperature Control

5. Advanced-Application Controllers
   a. Used to control equipment such as Chillers and RTU's preprogrammed and installed into the AAC by the manufacturer.
6. Algorithm: synonymous with programming
   a. A logical procedure for solving a recurrent mathematical problem; a prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.
7. Analog
   a. A continuously variable system or value not having discrete levels.
8. Application-Specific Controller
   a. Microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable but are customized for operation within the confines of the equipment they are designed to serve.
9. BACnet/IP
   a. A BACnet protocol which defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks.
10. Building Management System (BMS): synonymous with System
    a. The total integrated system of fully operational and functional elements, including equipment, hardware, and wiring, to be provided by this Division's contractor
11. Building Management System Contractor (BMSC): synonymous with Contractor
    a. The single contractor to provide the work of this Section.
    b. A two-state condition, i.e. "ON" or "OFF"
12. Contract Terms used in this specification section shall mean
    a. Commission: To provide technical device certification of design intent, including, calibration, initial field testing and functionality.
    b. Furnish: To supply at the contractor's cost to a third-party contractor for installation.
    c. Install / Installation: To receive and mount the device.
    d. Provide: To "Furnish", "Install", "Wire", and "Commission.
    e. Wire: To "Provide" this section control electric conductors and field device point terminations.
13. Control Loop
    a. A control algorithm, with an analog input and an output.
14. Custom Application Controller
    a. Used to control equipment and systems such as an AHU, cooling tower, and central plant applications by customized programming prepared and installed into the CAC by the BMSC to provide the performance specified in Part 4 of this section.
15. Deadband
    a. An analog range over which no change of state occurs.
16. Direct Digital Controller, synonymous with Controller (DDC)
    a. A generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control.
    b. Three types of controllers are indicated
       1) Supervisory Network Controller (SNC)
       2) Building Controller (B-BC)

3) Advanced Application Specific Controller (AAC)
4) Application-Specific Controller (ASC).

17. Floating
    a. A timed digital signal typically used to mimic an Analog value.
18. I/O: Input/Output
    a. A physical device or virtual node in which the Building Management System receives or transmits information through.
19. I/O Point Types: An analog or binary instance with an addressable database value.
    a. Analog Input (AI)
        1) Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature.
    b. Analog Output (AO)
        1) A continuous variable which provides control through a 4-20mA, 0-10VDC or other industry standard range. Typically used for control of Variable Speed Drives, control valves, or control dampers.
    c. Binary Input (BI): Synonymous with Digital Input (DI) or Contact Input (CI)
        1) Electronic signals are converted to a binary value; generally utilized for device status.
    d. Binary Output (BO), synonymous with Digital output (DO) or Contact Output (CO)
        1) DDC controller signals are converted to a binary value; generally utilized for device commands.
20. LAN
    a. A local internal communication bus structure that exchanges information between networked computers or devices.
21. Low Voltage
    a. As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
22. Sensor
    a. A control device that provides a monitored input response to an input (either analog or binary for use by the BMS)
    b. For the purposes of installation Sensor shall be synonymous with Thermostat, Humidistat, De-humidistat

1.4 SUBMITTALS

A. Submittal Approval

1. Submittals shall be approved before any equipment is installed.

B. Shop Drawings

1. Product Data:
    a. Any deviations from these specifications or the work indicated on the drawings shall be clearly identified in the Submittals.
    b. Each package shall be complete and shall only reference itself and previously submitted packages.
    c. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved.

d. When manufacturer's cut sheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means.
e. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements.
f. Filing shall be at the expense of the BMSC where filing is necessary.
g. Provide a copy of all related correspondence and permits to the Owner.
h. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
i. The BMSC shall correct any errors or omissions noted in the first review.
j. Clearly reference covered specification and drawing on each submittal.

2. At a minimum, submit the following:
   a. Sequence of Operation:
      1) Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system.
   b. Bill of Materials
      1) Complete bill of material indicating quantity, manufacturer, model number, and relevant technical data of equipment used.
      2) Manufacturer's description and technical data such as product specifications for items listed below and for relevant items provided or furnished under this contract not listed below:
      3) When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
      4) Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.
   c. Product data sheets
      1) Data sheets or marked catalog pages including part number, photo and description for all products including software.
      2) Manufacturer's description and technical data, such as product specification sheets, installation and maintenance instructions for items listed below and for relevant items not listed below:
      3) Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
      4) Operating characteristics, electrical characteristics, and accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
      5) Product description with complete technical data, performance curves, and product specification sheets.
      6) Installation, operation, and maintenance instructions including factors effecting performance.
   d. Control Damper Schedule
   e. Control Valve Schedules

C. BMS Hardware Submittal

1. Shop Drawings shall include and consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions. Submit in printed and electronic format.
2. Shop Drawings shall include the following requirements:
    a. Prepare an index sheet of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
    b. Shop drawings shall also contain complete wiring and schematic diagrams, sequences of operation, control system bus layout and any other details required to demonstrate that the system has been coordinated and shall properly function as a system.
    c. Shop drawings shall Specific Terminal identification for all control wiring shall be shown on the shop drawings (i.e. point to point diagram).
3. Product Data:
    a. Manufacturer's data sheets on each product to be used
    b. Data shall contain manufacturer's data on all hardware and software products required by the specification including:
        1) Preparation instructions and recommendations.
        2) Storage and handling requirements and recommendations.
        3) Installation methods.
4. Automatic Control Valve Schedules:
    a. Indicate control valve size
    b. Indicate flow pattern
    c. Indicate control valve connections and ratings
    d. Indicate control flow rate
    e. Indicate control valve pressure drop
    f. Indicate control valve CV rating
    g. Indicate control body material
    h. Indicate control valve temperature and pressure rating
    i. Indicate control valve location
    j. Indicate control valve tagging
    k. Indicate Leakage flow at maximum system pressure differential.
    l. Indicate Torque required at worst case condition for sizing actuator.
    m. Indicate actuator selection indicating torque provided.
    n. Indicate Maximum close-off pressure.
    o. Indicate actuator signal to control valve (on, close or modulate).
    p. Indicate actuator position on loss of power.
    q. Indicate actuator position on loss of control signal.
    r. Indicate control valve actuator power requirements

D. As Built Drawings

1. All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation.
2. All shop drawings shall be acknowledged in writing by the A/E before installation is started and again after the final checkout of the system.
3. The BMS system shall not be considered complete until the 'as-built' drawings have received their final approval.

E. Operation and Maintenance (O&M) Manual Submittal

1. Upon completion of the work of this Section, Operation and Maintenance Manuals shall be provided to the Owner's Representative. The Operation and Maintenance Manual electronic media shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized table of contents shall provide dynamic links to view and print all product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents. This shall include the following categories:
    a. Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
2. System Maintenance Requirements:
    a. Maintenance instructions and lists of spare parts for each type of control device.
    b. Interconnection wiring diagrams with identified system components and devices.
    c. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
3. Testing and Commissioning Reports and Checklists.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility of System performance

1. The BMSC shall be responsible for the complete installation and proper operation of the control system.

1.6 WARRANTY - MATERIAL AND LABOR

A. Warranty Period

1. Warrant labor and materials for specified BMS free from defects for a period of 12 months after final acceptance. BMS failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner, and shall cover all costs for parts, labor, associated travel, and expenses Respond during Owner’s business hours within 24 hours of Owner’s warranty service request.
2. Date of acceptance shall begin warranty period Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
3. Date of acceptance shall begin warranty period.
4. Exception: Reused equipment, devices and controllers identified in the BMS submissions as existing shall not be required to be warranted.

PART 2 - PRODUCTS

A. Thermostats

1. Low-Voltage, On-Off Thermostats: 24-V, bimetal-operated, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2°F maximum differential.

2. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 ° F maximum differential.
3. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated'
   a. Bulbs in water lines with separate wells of same material as bulb.
   b. Bulbs in air ducts with flanges and shields.
   c. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
   d. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
   e. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

2.2 CONTROL OUTPUTS

A. Control Valve Actuators

1. Actuator sizing:
   a. The control valve actuator shall be sized for sufficient force to operate the valve under all conditions and sized for torque required to guarantee tight close off of valves, as specified, against system differential pressure encountered.
   b. Two-way control valve actuators shall provide a close off rating exceeding the maximum pressure difference between the valve outlet and inlet.
2. Power Requirements:
   a. Actuators shall be electronic, 24 VAC or 120 VAC, class 2 as directed by the application, and as selected by the contractor.
   b. Actuators shall have internal electronic overload protection or digital rotation sensing circuitry. End switches to deactivate at the end of rotation or magnetic clutches are not acceptable.
   c. Power consumption shall not exceed 10 VA for AC.
3. Modulating Control Signal:
   a. Spring return actuators shall be capable of CW or CCW mounting orientation.
   b. Actuators shall be controlled from a 2 to 10 VDC or 4 to 20 mA.
   c. Actuators for VAV applications shall be "drive open; drive closed" type.
   d. Noise Generation:
   e. Spring return actuators shall not produce more than 62 dbA when powered or positioning.
   f. Non-spring return actuators shall have a maximum noise rating of 45 dbA with power on or in the running or driving mode.
4. Fail Safe Operation:
   a. Spring return actuators shall be selected for modulating or two position, with a Fail-Safe position, as specified.
   b. Spring return actuators shall upon a loss of control signal, fail to the minimum control signal.

c. Non-spring return actuator shall maintain the last position upon loss of power.

5. Coupling:
   a. Control valve actuators shall be of a Direct coupled type designed for minimum 60,000 full stroke cycles at rated torque.
6. Operation Time
   a. The run time for full stroke operation shall not exceed 120 seconds.
   b. Spring return to the failsafe position shall take no longer than 10 seconds closed.
   c. Non-spring return actuators greater than 60 in-lb. of torque shall have a local external, manual gear release.
7. Construction:
   a. Control valve actuator casings shall be made of die cast metal.
8. Position Indication:
   a. Actuators on valves larger than 2 inch shall have a visual position indication.
   b. When required by the control sequence, two sets of DPDT switches with fully adjustable setpoints shall be provided.
9. Environment Rating:
   a. Actuator enclosures shall be rated for the mounting environment
   b. Actuators shall have an operating range of minus 22 to 122 degrees F.
   c. Actuators exposed to low temperatures shall have a crankcase heater.

2.3 CONTROL VALVES

A. General

1. Control valves shall be factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
2. The control valve nominal body rating shall be not less than 125 PSI.
3. Control valve body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule in this specification.
4. The control valves shall be sized by the contractor to produce the required flow capacity at a pressure loss not exceeding the allowable pressure drop.
5. The control valve body and packing selected shall be sized to withstand the system static head plus the pump head, and the temperatures of the control medium.
6. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved.
7. Connections:
8. Control valve sizes up to, including 2 inch shall be "screwed" configuration
9. Control valve sizes 2 1/2 inch and larger shall be "flanged" configuration.
10. All control valves shall have a close-off pressure rating higher than the pump differential pressure rating. Refer to the pump schedule on the drawings.
11. All control valves shall be easily accessible for servicing. Do not locate in the unit cabinet unless a piping cabinet has been provided for that purpose.
12. All heating valves, except for VAV boxes shall be spring return and shall fail open. Valves at VAV boxes shall be floating and fail at last controlled position. All chilled water valves shall be spring return and shall fail closed.

13. All control valve actuators shall be 24 volt unless the application dictates another voltage. The HC shall provide transformers and low voltage control wiring. Coordinate location of the transformers with the EC to obtain line voltage power.
14. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

D. Characterized Control Valves

1. NPS 3 and Smaller: Nickel-plated forged brass body rated at no less than 400 psi, stainless steel ball and blowout proof stem, female NPT end fittings, with a dual EPDM O-ring packing design, fiberglass reinforced Teflon seats, and a TEFZEL flow characterizing disc.
2. Sizing:
   a. Two-Position: Line size or size using a pressure differential of 1 psi.
   b. Two-Way Modulating: 3 psig or twice the load pressure drop, whichever is more.
   c. Three-Way Modulating: Twice the load pressure drop, but not more than 3 psig.
3. Close-Off Pressure Rating: 100 PSI.
4. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory with a single screw on a four-way DIN mounting-base.

J. Zone Valves (On/Off Two-Position Applications)

1. Forged brass body, stainless steel stems, female, and EPDM seals.
2. Sizing: Max 2 psi pressure drop across valve
3. Close-Off Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system head pressure for two-way valves and 125 percent of the design pressure differential across the three-way valves.
4. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory.
5. The manufacturer shall warrant all components for a period of 2 years from the date of production.

2.4 CONTROL POWER TRANSFORMERS & POWER SUPPLIES

A. Control power transformers shall be UL listed, Class 2 current limiting type, or shall be provided with over current protection with primary and secondary circuits for Class 2 service.

B. Unit power output shall match the required output current and voltage requirements. Current output shall allow for a 50 percent safety factor. Output ripple shall be 3.0 mV maximum Peak to Peak. Regulation shall be 0 to 10 percent line and load combined, with 50 microsecond response time for 50 percent load changes. Unit shall have built in over voltage protection.

C. Unit shall operate between 32 to 120 degrees F.

D. Unit shall be UL recognized.

2.5 LOCAL CONTROL ENCLOSURES AND PANELS

A. All control cabinets shall be of steel construction and rated for the environment in which they are located with (hinged door) key lock latch and removable sub panels. A single key shall be common to all field panels and sub panels.

B. Interconnections between internal and face mounted devices shall be prewired with color coded stranded conductors neatly installed in plastic troughs and/or tie wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

C. Provide ON/OFF power switch with over current protection for control power sources to each local panel.

D. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

E. All control panels shall be UL inspected and listed as an assembly and carries a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.

F. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed 300-volt service and provide adequate clearance for field wiring.

G. All wiring shall be neatly installed in plastic trays or tie wrapped.

PART 3 - EXECUTION

3.1 OVERVIEW

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be provided and installed by the BMSC in accordance with these specifications.

C. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

D. All output devices shall be installed per the manufacturer’s recommendation.

E. The contractor shall coordinate the installation of temperature sensor thermos-wells and piping accessories.

3.2 CODE COMPLIANCE

A. NEC compliance:

1. All wiring shall be installed in accordance with all applicable electrical codes and shall comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring specifications in this section and Electrical sections, the stricter wiring requirements shall prevail.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. All electrical control wiring to the control panels shall be the responsibility of the BMSC.

B. All wiring shall be in accordance with the Project Electrical Specifications, the National Electrical Code, and any applicable local codes.

C. Control wiring shall be of adequate length for the installation. Excess wire shall not be looped or coiled in the controller cabinet.

D. Use approved optical isolation and lightning protection when penetrating building envelope.

E. Power Wiring

1. 120 VAC circuits used for the BMS shall be taken from panel boards and circuit breakers.
2. BMS power circuits shall be dedicated to the BMS devices and shall not be used for any other purposes.
3. All NEC Class 1 (line voltage) wiring shall be UL Listed and installed approved conduit according to NEC requirements.
4. Power wiring must meet NEC / Local standards; minimum 12 gauge, stranded, THHN
5. Power and Class One wiring may be run in the same conduit.
6. Where different wiring classes terminate within the same enclosure, maintain clearances, and install barriers per the National Electric Code.

F. BMS Raceway

1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification.
2. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
3. Include one pull string in each conduit 3/4 in. or larger.
4. All wiring in mechanical, electrical, or service rooms, or where subject to mechanical damage shall be installed in conduit.
5. All Conduit shall be concealed, except within mechanical, electrical, or service rooms.
6. Conduit in finished areas shall be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction.
7. Exposed conduit shall run parallel to or at right angles to the building structure.
8. Install conduit to maintain a minimum clearance of 6 inches from high temperature equipment (e.g., steam pipes or flues).
9. Class 2 and 3 wiring and communications wiring may be run in the same conduit.
10. Support:

a. Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements.
b. Conduit and pull boxes shall not be hung on flexible duct strap or tie rods.
c. Conduits shall not be run on or attached to ductwork

11. Couplings and Terminations:
    a. Conduit sections shall be joined with couplings (according to code).
    b. Conduit section terminations shall be made with fittings at boxes, as needed.
    c. Conduit section terminations not ending in boxes shall have bushings installed.
12. Class Separation:
    a. Where different wiring classes terminate within the same enclosure, maintain clearances, and install barriers per the National Electric Code.
13. Exterior & High Moisture Prone Locations:
    a. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture.
    b. Conduit seal off fittings shall be utilized where exterior conduits enter the building or between areas of high temperature/moisture differential.
14. Flexible Metallic Conduit:
    a. Flexible metallic conduit shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment.
    b. Flexible metal conduits shall not exceed 3 feet in length and shall be supported at each end.
    c. Flexible Metal Conduit may be used within partition walls.
    d. Flexible Metal Conduit shall be UL listed
    e. Flexible metal conduit minimum size is ½ inch.
    f. Liquid tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
15. Surface Raceway
    a. Where it is not possible to conceal raceways in finished locations, surface raceway may be used as approved by the Architect.
    b. Metallic surface raceway may be used in finished areas on masonry walls.
    c. All surface raceway in finished areas must be color matched to the existing finish.
16. Conduit and Raceway Sizing
    a. The sizing, type and provision of conduit and raceways shall be the design responsibility of the BMSC.
    b. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the BMS Contractor shall be responsible for all costs incurred in replacing the selected components.
17. Junction Boxes
    a. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit.
    b. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover.
    c. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers. ¨

G. BMS Control Wiring

1. Do not install communication wiring in conduit or raceway containing Class 1 or other Class 2 wiring.
2. All wiring shall comply with the requirements of applicable portions of all local and national electric codes, unless specified otherwise in this section.
3. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated.
4. All control and interlock wiring shall comply with national and local electrical codes.
5. Where the wires leave the conduit system, they shall be protected by a plastic insert.
6. Class 2 Wiring
    a. All low voltage wiring shall meet NEC Class 2 requirements. (Low voltage power circuits shall be sub fused when required to meet Class 2 current limit.)
    b. Class 2 signal wiring and 24 VAC power can be run in the same conduit.
    c. Do not install Class 2 wiring in conduit containing Class 1 wiring or tubing.
    d. Boxes and panels containing high voltage wiring and equipment may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and
7. Installation:
    a. Wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 10 feet intervals.
8. Cable Support
    a. Plenum rated cable shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical conduits, piping, or ceiling suspension systems.
9. Wiring Device Terminations
    a. All wire-to-device connections shall be made at a terminal block or wire nut.
    b. All wire-to-wire connections shall be at a terminal strip or wire nut.
    c. Exposed terminations shall not be acceptable. Terminations shall be contained within either the device or local junction box.
    d. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
10. No Splices:
    a. All wiring shall be installed as continuous lengths, with no splices permitted between termination points
11. Grounding:
    a. Provide for complete grounding of all applicable panels, and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

H. Wall and Floor Penetrations

1. Provide fire stopping for all penetrations used by conduits and raceways.
2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

I. Enclosures

1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
2. For all I/O requiring field interface devices, these devices shall be mounted in a Field Interface Panel (FIP). The BMSC shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
3. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
4. All wiring to and from the FIP shall be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
5. All outside mounted enclosures shall meet the NEMA-4 rating.
6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

J. Damper Actuators

1. Shall be firmly mounted to give positive movement and linkage shall be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
2. Actuators: The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.
3. Opposed blade dampers shall be installed for modulating control of airflow.
4. Parallel blade dampers shall be installed for two position applications.
5. Damper actuators shall be installed on the outside of duct in warm areas, not in locations exposed to outdoor temperatures.

K. Relay Outputs

1. Transient suppression shall be provided across all coils. Suppression devices shall limit transients to 150 percent of the rated coil voltage.

L. Outside Air Sensors

1. Outdoor air sensors shall be mounted on the northerly facing directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
2. Sensors shall be installed with a rain proof, perforated cover.

M. Duct Temperature Sensors

1. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
2. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
3. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
4. The sensor shall be mounted to suitable supports using factory approved element holders.

N. Space Sensors

1. Space Sensor locations indicated on the plan are diagrammatic. Verify location of thermostats, humidistats, and other exposed control sensors with drawings and room details before installation. Provide a plan showing location and approved by the Owner and Architect. Coordinate with other wall mounted equipment.
2. Install top of devices 48 inches above the finished floor or per ADA requirements.
3. Field-coordinate locations with all cabinetry, shelving, furniture, etc. All mounted sensors shall be installed such that they conform to all ADA requirements, including, but not limited to:
    a. Sensors located in circulation paths (i.e. corridors, halls, etc.) shall be installed such that element does not encroach more than 4 inches into circulation path.
    b. Sensors shall be installed such that there is an unobstructed forward reach. Sensor may be installed with an obstructed high forward reach when obstruction depth is less than 20 inches AND there is a clear floor space extending beneath the element for the entire depth of the obstruction.
4. Space humidity or temperature sensors shall be mounted away from machinery generating heat, direct light, and diffuser air streams.

O. Low Temperature Limit Switches

1. Provide a freezestat for all units with a hot water coil and a ducted outside air connection Alarm activation shall de-energize the supply fan, close the outside air damper, and open the heating valve.
2. Install the freezestat upstream of the first coil for equipment with coil design EAT above 55°
3. Install the freezestat downstream of heating coil for equipment with coil design EAT below 40°F
4. Mount element horizontally across duct in a serpentine pattern ensuring each square foot of coil is protected by 1 foot of sensor.
5. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

P. Air Differential Pressure Status Switches

1. Install with static pressure tips, tubing, fittings, and air filter.

3.4 IDENTIFICATION

A. Cables: Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross referenced with BMS as-built drawings.

B. Enclosures: All field enclosures, other than controllers, shall be identified with an engraved nameplate. The lettering shall be in white against a black or blue background.

C. Field Devices: All I/O field devices that are not mounted within FIPs shall be identified with name plates.

3.5 SYSTEM TESTING

A. Calibrating and Adjusting

1. Initial Setpoints: Adjust initial temperature and humidity set points.
2. Temperatures: Calibrate temperature switches to make or break contacts.
3. Dampers and Valves: Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

B. Demonstration

1. At the completion of the Acceptance Testing, this BMS contractor shall demonstrate the sequence of operations for each system to the Owner or his representative.

3.6 TRAINING

A. Onsite System Training:

1. The Contractor shall provide training for system orientation, product maintenance and troubleshooting, programming.

3.7 PROJECT SPECIFIC REQUIREMENTS

A. Control Valves

1. Hot water control valves shall fail Normally Open to the coil.
2. Provide control valve types as follows:
   a. Baseboard — Zone Valves
   b. Cabinet Heaters — 2-way Characterized Control Valves
   c. Unit Heaters — 3-way Characterized Control Valves

B. Control Wiring

2. All low voltage wiring for the BMS work shall be plenum rated.
3. Run control wiring in metal surface raceway in the following locations:
   a. At room sensors where wiring cannot be concealed.
4. Run control wiring in conduit in the following locations:
   a. Mechanical rooms.
   b. Storage Rooms.
5. Run control wiring using plenum rated cable in the following locations:
   a. Concealed above ceilings.
   b. Concealed within walls.

END OF SECTION 23 0900

SECTION 23 0901 – AUTOMATIC TEMPERATURE CONTROLS SEQUENCE OF OPERATIONS

PART 1- SEQUENCE OF OPERATIONS TEMPLATES

1.1 UNIT CONTROL INTERFACE TEMPLATE DDC/STANDALONE: The equipment is provided with pre-programmed DDC controls and there is no requirement for BMS integration.

B. ELECTRO MECHANICAL: The equipment is provided with no controls, provide electro-mechanical controls to perform the operating sequences. Refer to wiring diagrams on drawings.

1. At the contractor's discretion, it will be acceptable to provide standalone DDC controllers without BMS integration to provide the specified control functions and intent.

1.2 COMMON CONDITIONS CONTROL SEQUENCE TEMPLATE

A. The following common conditions shall be provided at the local control.

1. Occupied Mode:
   a. Cooling Setpoint: 76°F (adj.)
   b. Heating Setpoint: 72°F (adj.)
   c. Humidify Setpoint: 40% rh (adj.)
   d. Dehumidify Setpoint: 60% rh (adj.)
2. Unoccupied Mode:
   a. Cooling Setpoint: 85°F (adj.)
   b. Heating Setpoint: 60°F (adj.)
   c. Humidify Setpoint: 40% rh (adj.)
   d. Dehumidify Setpoint: 60% rh (adj.)

1.3 SUPPLY FAN CONTROL - CAV SEQUENCE TEMPLATE

A. The unit controller shall enable the supply fan to run continuously at design CFM, unless shutdown on faults, safeties, duct smoke detectors and low limit freezestats.

1. On units without supply airflow measuring capability, supply fan VFD speed setpoints shall be established by the TAB contractor for the respective design CFM flow rate.

1.4 EXHAUST FAN CONTROL – CAV SEQUENCE TEMPLATE

A. The exhaust fan is enabled when the supply fan is running, and the outside air damper is open. The exhaust fan remains enabled until either of the following occur;

1. The supply fan is not running.
2. The outside air damper is not open.

B. When the return fan is running, its capacity shall modulate to maintain the design CFM,

unless shutdown on faults or safeties.

1. On units without airflow measuring capability, the exhaust fan VFD speed setpoints shall be established by the TAB contractor for the respective design CFM flow rate.

1.5 DISCHARGE TEMPERATURE CONTROL – DOAS SEQUENCE TEMPLATE

A. In the Heating and Cooling Modes, the discharge air temperature setpoint shall provide neutral air of 70°F (adj.).

1.6 GAS HEATING CONTROL SEQUENCE TEMPLATE

A. The unit controller shall measure the supply air temperature and modulate/stage the heating capacity to maintain the discharge air setpoint, unless shutdown on faults, safeties.

B. There shall be a 3°F (adj.) deadband between energizing the heating and cooling modes. In the deadband range, both the heating and the cooling shall be disabled.

1.7 DX COOLING SEQUENCE TEMPLATE

A. The unit controller shall measure the supply air temperature and modulate/stage the cooling capacity to maintain the discharge air setpoint.

B. There shall be a 3°F (adj.) deadband between energizing the heating and cooling modes. In the deadband range, both the heating and the cooling shall be disabled.

1.8 CONDENSATE HIGH LEVEL OVERFLOW SAFETY SWITCH CONTROL SEQUENCE TEMPLATE

A. Disable cooling upon high level or overflow water detection by the safety switch.

1.9 DEHUMIDIFICATION CONTROL-DX HOT GAS SEQUENCE TEMPLATE

A. On a rise in space/return air humidity; cooling capacity shall stage/modulate to maintain cooling coil temperature below the entering air dewpoint. If the discharge air temperature drops below setpoint the hot gas reheat coil shall energize and maintain discharge air setpoint

1.10 DEHUMIDIFICATION CONTROL-PACKAGED UNIT SEQUENCE TEMPLATE

A. On a rise in space/return air humidity; dehumidification capacity shall stage/modulate to maintain dehumidification setpoint.

1.11 STEAM HUMIDIFIER SEQUENCE TEMPLATE

A. On a fall in space/return air humidity; humidification capacity shall stage/modulate to maintain humidification setpoint.

1.12 ENERGY RECOVERY WHEEL CONTROL SEQUENCE TEMPLATE

A. The energy recovery wheel shall be enabled in the occupied mode.

B. In economizer mode the heat wheel shall de-energize, the bypass damper shall open.

C. Provide control functions to limit frost formation and limit the exhaust air temperature from operating below the dew point.

1.13 UNIT HEATER- HW ELECTRO-MECHANICAL SEQUENCE TEMPLATE

A. Run Conditions:

1. A space heating thermostat shall control a three-position control valve. On a drop in space temperature below heating setpoint, the control valve shall open.
2. Upon sensing hot water temperature above the minimum hot water system setpoint, a return water aquastat shall enable the supply fan to run.
3. The reverse shall occur on a temperature rise above setpoint.
4. Refer to wiring diagrams on the contract drawings.

1.14 CABINET UNIT HEATER-HW ELECTRO-MECHANICAL SEQUENCE TEMPLATE

A. Run Conditions:

1. A space heating thermostat shall control a two position control valve. On a drop in space temperature below heating setpoint, the control valve shall open.
2. Upon sensing hot water temperature above the minimum hot water system setpoint, a return water aquastat shall enable the supply fan to run.
3. The reverse shall occur on a temperature rise above setpoint.
4. Refer to wiring diagrams on the contract drawings.

1.15 FIN TUBE RADIATION CONTROL DDC SEQUENCE TEMPLATE

A. Run Conditions:

1. The space sensor shall control a two-position control valve. On a drop in space temperature below heating setpoint, the control valve shall open,
2. When hot water is suitable for heating, the fin tube radiation shall operate as the first stage of heating in the space.
3. A single BMS temperature sensor and setpoint shall be used for all equipment controlled or monitored within a common space.

1.16 DESTRATIFICATION FAN CONTROL SEQUENCE TEMPLATE

A. Refer to wring diagram on drawing.

1.17 GENERAL EXHAUST FAN CONTROL SEQUENCE TEMPLATE

A. SPACE TEMPERATURE-THERMOSTAT: The local thermostat in the control circuit of this fan shall enable the exhaust fan when the space temperature exceeds the space temperature setpoint. The reverse shall occur on space temperature decrease.

1.18 DUCTLESS SPLIT SYSTEMS SEQUENCE TEMPLATE

A. These units are standalone and are not integrated into the BMS, refer to equipment IOM from approved submittals for sequence of operation.

PART 2- BUILDING CONTROL SEQUENCE REQUIREMENTS

2.1 BUILDING SPECIFIC CONTROL SEQUENCE REQUIREMENTS

A. A central station Building Management System- BMS is not included in this project.

2.2 ROOFTOP UNIT CONTROL SEQUENCE REQUIREMENTS

A. RT-1: (SF, EF, Gas, DX, HGR, ERW) Provide the operating features below based on the control sequences templates above:

1. Unit Control Interface Template-DDC/STANDALONE
2. Supply Fan Control– CAV Control Sequence
3. Exhaust Fan – CAV Control Sequence
4. Discharge Temperature Control – DOAS Control Sequence
5. Gas Heating Control Sequence
6. DX Cooling Control Sequence
7. Dehumidification Control – DX Hot Gas Reheat Sequence
8. Energy Recovery Wheel Control Sequence

2.3 CABINET UNIT HEATER CONTROL SEQUENCE REQUIREMENTS

A. CH-1: Provide the operating features below based on the control sequences templates above:

1. Unit Control Interface Electro-Mechanical
2. Common Conditions Control Sequence
3. Cabinet Unit Heater- HW Electro-Mechanical Sequence

2.4 DEHUMIDIFIER CONTROL SEQUENCE REQUIREMENTS

A. DU-1, 2, 3: Provide the control features below based on the descriptions above:

1. Unit Control Interface Template-DDC/STANDALONE
2. Common Conditions Control Sequence
3. Dehumidifier Control Sequence
4. Condensate High Level Overflow Safety Switch Control Sequence

2.5 HUMIDIFIER CONTROL SEQUENCE REQUIREMENTS

A. H-1, 2: Provide the control features below based on the descriptions above:

1. Unit Control Interface Template-DDC/STANDALONE
2. Common Conditions Control Sequence
3. Steam Humidifier Control Sequence

2.6 UNIT HEATER CONTROL SEQUENCE REQUIREMENTS

A. UH-1: Provide the operating features below based on the control sequences templates above:

1. Unit Control Interface Electro-Mechanical
2. Common Conditions Control Sequence
3. Unit Heater- HW Electro-Mechanical Sequence

2.7 FIN TUBE RADIATION CONTROL SEQUENCE REQUIREMENTS

A. BB-1-9: Provide the operating features below based on the control sequences templates above:

1. Unit Control Interface -Electro-Mechanical
2. Common Conditions Control Sequence
3. Fin Tube Radiation Control Sequence

2.8 DUCTLESS SPLIT SYSTEM CONTROL SEQUENCE REQUIREMENTS

A. SS/HP: Provide the control features below based on the descriptions above:

1. Unit Control Interface Template-DDC/STANDALONE
2. Common Conditions Control Sequence
3. Ductless Split Systems Control Sequence

2.9 DESTRATIFICATION CONTROL SEQUENCE REQUIREMENTS

A. DSF-1: Provide the operating features below based on the control sequences templates above:

1. Unit Control Interface - Electro-Mechanical
2. Destratification Fan Control Sequence

2.10 BUILDING EXHAUST FAN CONTROL SEQUENCE REQUIREMENTS

A. Refer to the Exhaust Fan table below for identification of the control method and sequencing requirements for each exhaust fan.

B. Exhaust Fan Control Table

Fan	Control Method / Interlocked Equipment
EF-1	Local Thermostat

PART 3 - EXECUTION

3.1 RELATED DOCUMENTS

A. Contract Drawings, Section 23 0900.

END OF SECTION 23 0901

SECTION 23 2113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Condensate-drain piping.

B. Related Sections include the following:

1. Division 23 Section “Basic Mechanical Materials and Methods” for general piping materials and installation requirements.
2. Division 23 Section “Hangers and Supports” for pipe supports, product descriptions and installation requirements.

1.3 SUBMITTALS

A. Product Data: For each type of the following:

1. Expansion Joints.
2. Hydronic specialties (Air vents, air separators, expansion tanks, strainers, etc.).
3. Grooved joint couplings and fitting shall be referred to on drawings and product submittals and be identified by the manufacturer’s listed model or series designation.
4. Piping materials, fittings, etc.
5. Strainers.
6. Flexible Connectors.

B. Shop Drawings: Detail, at 1/4” = 1’-0” scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. All grooved couplings, and fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

D. International Mechanical Code.

1.5 COORDINATION

A. Coordinate layout and installation of hydronic piping and suspension system components with other construction, including light fixtures, plumbing piping, HVAC equipment, fire-suppression system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate piping installation with roof curbs, equipment supports, and roof penetrations.

D. Coordinate pipe fitting pressure classes with products specified in related Sections.

E. Coordinate size and location of concrete bases. Cast anchor bolt inserts into base.

F. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for fire stopping specified in Section 23 0050.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Grooved Mechanical-Joint Fittings and Couplings:
   a. Victaulic Company of America.
   b. Anvil International, Inc.

c. Grinnell

2. Safety Valves:
   a. Amtrol, Inc
   b. Conbraco Industries, Inc
   c. ITT McDonnell & Miller Div.; ITT Fluid Technology Corp.
3. Copper Press Fittings:
   a. Viega, 17545 Daleview Dr., Lakewood, OH 44107, 877.620.0016, www.viega-na.com
   b. Nibco Inc., 1516 Middlebury St. Elkhart, IN 46516, 1-800-234-0227, www.nibco.com
   c. Elkhart Products Corporation, 1255 Oak Street, Elkhart IN 46514, 1-800-284-4851, www.elkhartproducts.com

PART 3 - PIPING MATERIALS

MATL TYPE	PIPE SIZE	PIPE TYPE	PIPE SPEC	FITTING TYPE	FITTING SPECIFICATIONS
1	2" & Smaller	Sch. 40 Black Steel, Screwed End	ASTM A53 / A53m	Class 150 Black Malleable Iron, Screwed	ASME B16.3
5	All Sizes	Type 'L' Hard-Drawn Copper	ASTM B88	Wrought or cast Solder Joint Grooved	ANSI B16.22 ANSI B16.18
6	All Sizes	Type K Annealed Cop-per Tubing	ASTM B88	Wrought Copper, Silver Brazed Joint	ANSI B16.22

3.1 FITTINGS

A. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

B. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

C. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

D. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

E. Grooved Mechanical Fittings: ASTM A 536, Grade 65-45-12 Ductile Iron; ASTM A 53, Type F, or Types E or S, Grade B factory-fabricated steel; or ASTM A 234, Grade WPB steel fittings with grooves or shoulders designed to accept grooved end couplings. Basis of Design: Victaulic Company.

F. Grooved Mechanical Couplings: Consist of two ductile iron housings, a synthetic rubber gasket of a central cavity pressure-responsive design; with ASTM A449 electroplated steel nuts and bolts to secure grooved pipe and fittings. Couplings shall comply with ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

1. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9. Victaulic Style 107H/107N (Quick-Vic™). Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade “EHP” EPDM designed for operating temperatures from -30 deg F (-34 deg C) to +250 deg F (+120 deg C).
2. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the vibration source. 2” (DN50) through 8” (DN0200): Victaulic Style 177 (Quick-Vic™). Installation ready flexible coupling or Victaulic Style 75 or 77 standard flexible couplings.
3. Victaulic AGS Mechanical Couplings, 14 inch (DN350) through 60 inch (DN1500): Couplings shall consist of two ASTM A-536 ductile iron housing segments with lead-in chamfer on housing key, a wide-width elastomer pressure responsive gasket, and zinc electroplated carbon steel track head bolts and nuts conforming to the physical and chemical requirements of ASTM A-449 and the physical requirements of ASTM A-183.
    a. Victaulic W07 AGS Rigid Coupling: Coupling key shall be designed to fill the wedge shaped AGS groove to provide a rigid joint.
    b. Victaulic W77 AGS Flexible Coupling: Coupling key shall be designed to fit into the wedge shaped AGS groove and allow for linear and angular movement, vibration attenuation, and stress relief.

G. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.

H. Cast-Iron Threaded Flanges: ANSI B16.1, Class 125; raised ground face, bolt holes spot faced.

I. Cast Bronze Flanges: ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.

J. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets.

K. Unions: ASME B16.39 malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.

L. Dielectric Unions or Waterway Fittings: Threaded, grooved, or soldered end connections for the pipe materials in which installed; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion. Basis of Design: Victaulic Style 47 and 647.

M. Flexible Connectors: Stainless steel bellows with woven flexible bronze wire reinforcing protective jacket; minimum 150 psig working pressure, maximum 250 degree F operating temperature. Connectors shall have flanged or threaded end connections to match equipment connected; and shall be capable of 3/4 inch misalignment.

1. Four Victaulic flexible couplings may be used in lieu of flexible connectors for vibration attenuation. The couplings shall be placed in close proximity to the source of the vibration.

3.2 JOINING MATERIALS

A. Solder Filler Metals: Refer to Section 23 0050.

B. Brazing Filler Metals: Refer to Section 23 0050.

C. Gasket Material: Refer to Section 23 0050.

D. Grooved Joint Lubricants: Refer to Section 23 0050.

3.3 VALVES

A. Valves are specified in Section 23 0523 “General Duty Valves for Mechanical Piping”.

B. Refer to Part 3 "Valve Applications" Article for applications of each valve.

C. Safety Valves: Diaphragm-operated, bronze or brass body with brass and rubber, wetted, internal working parts; shall suit system pressure and heat capacity and shall comply with the ASME Boiler and Pressure Vessel Code, Section IV.

1. Acceptable Product: www.Conbraco.com Apollo Valves. Series “10”.

3.4 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 125-psig working pressure; 240 deg F operating temperature; manually operated with screwdriver or thumbscrew; with NPS 1/8 discharge connection and NPS 1/2 inlet connection.

1. Acceptable Product: www.taco-hvac.com Taco Inc. “Taco 417 Vent”

B. Y-Pattern Strainers: 300-psig working pressure; ductile-iron body (ASTM A 536, Grade 65-45-12) with grooved ends or cast-iron body (ASTM A 126, Class B), flanged ends for NPS 2-1/2 and larger, threaded connections for NPS 2 and smaller, bolted cover, perforated stainless-steel basket, and bottom drain connection. Basis of Design: Victaulic Style 732 / W732.

C. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged- or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment.

1. Acceptable Product: www.metraflex.com The Metraflex Company Model “MLP”

D. Flexible Hose Expansion Loops; Stainless Steel

1. General Project Requirements
   a. Provide flexible hose expansion loop(s) as required to accommodate any thermal expansion, contraction, or seismic movement of the piping system.
   b. Flexible hose expansion loops shall be manufactured complete with two parallel sections of corrugated metal house, compatible braid, 180^0 return bend, with inlet and outlet connections. Field fabricated loops shall not be acceptable.
   c. Flexible loops shall be capable of movement in the ±X, ±Y, and ±Z planes.
   d. Flexible hose expansion loops shall impart no thrust loads to system support, anchors or building structure.
   e. All flexible hose expansion loops shall be manufactured in accordance with the documented manufacturers weld procedure specifications in accordance with ASME Section IX.
   f. All flexible hose expansion loops shall be manufactured in accordance with ASME / ANSI B31.1
   g. Delegated-Design Submittal: Provide analysis signed and sealed by a qualified professional engineer. Submittal shall include:
      1) Design Calculations: Calculate requirements for thermal expansion of piping systems and criteria for selecting and designing expansion joints, hard-pipe loops, and swing connections.
      2) Schedule and drawings: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and locations for each expansion joint, anchor and guide.
      3) Anchor Details: Detail fabrication of each anchor indicated. Show dimensions, methods of assembly, and attachment to building structure.
      4) Alignment Guide Details: Detail field assembly and attachment to building structure.
2. Products
   a. Flexible hose expansion loops to be "Metraloop®” as manufactured by The Metraflex Company®, Chicago, IL; or approved equal
   b. Corrugated Hose
      1) Stainless Steel, Type 321.
      2) Braid: 304 Stainless Steel braid shall be used for any series 300 stainless steel hose.
   c. Flexible hose expansion loops shall have a factory supplied; hanger / support lug located at the bottom of the 180^0 return.
   d. Flexible hose expansion loop(s) shall be furnished with a plugged FPT to be used for a drain or air release vent.

e. Flexible hose expansion loop(s) shall be rated with an operating pressure in accordance with manufacturer's documentation. The operating pressure shall be based on burst pressure with a 4 to 1 safety factor.

E. Grooved End Expansion Joints:

1. Packless, Gasketed, Type: 350-psig maximum, grooved ends, telescoping type expansion joint consisting of a ductile iron housing, carbon steel ends, with PPS modified PTFE slide section coating. Suitable for axial end movement to 3" / 80mm. Basis of Design: Victaulic Style 150.
2. Expansion fitting consisting of a series of grooved end nipple sections joined in tandem with Victaulic flexible type couplings. Pressure rating and total joint movement dependent on pipe size and the number of couplings used in the joint. Basis of Design: Victaulic Series 155.

PART 4 - EXECUTION

4.1 PIPING APPLICATIONS

SERVICE	PIPE MATERIAL TYPE
Hot Water	1 & 5
Refrigerant Piping	6
Condensate Drains (Non-Condensing)	5
Chemical Feed for Hot & Chiller Water Systems	1 & 5
Miscellaneous Drains (Not listed above)	5

A. Hot Water, NPS 2 and Smaller: Belowground or within slabs, use Type K annealed-temper copper tubing with soldered joints and wrought –copper fittings. Use the fewest possible joints belowground and within floor slabs.

1. Victaulic Vic-Press for Schedule 10S pipe may be used in lieu of soldered copper or threaded/welded steel for pipe sizes 2" and smaller.

B. Press Fittings may be used for copper heating and chilled water applications provided approved o-rings are used. Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

4.2 VALVE APPLICATIONS

A. Install shutoff duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, unless only one piece of equipment is connected in the branch line.

B. Install calibrated balancing valves in the return water line of each heating element and elsewhere as required to facilitate system balancing. Coordinate with the Testing and Balancing Technician.

C. Install check valves at each pump discharge and elsewhere as required to control flow direction.

D. Install pressure-reducing valves on boilers and elsewhere as required to regulate system pressure.

4.3 PIPING INSTALLATIONS

A. Refer to Division 23 Section "Basic Materials and Methods (Mechanical)" for basic piping installation requirements.

B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

C. Use fittings for all changes in direction and all branch connections. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal. Install drains at all low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.

D. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves six inches and larger shall be sheet metal.

E. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Seal penetrations to maintain assembly UL rating. Refer to Section
23 0050.

F. Install dielectric nipples or unions to join dissimilar metals.

G. Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment. Install flexible connector to HVAC equipment that is supported with vibration isolators. Connector size to match pipe size.

H. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

I. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

J. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

K. Unless otherwise indicated, install branch connections to mains using tee fittings in main pipe, with the takeoff coming out the bottom of the main pipe. For up-feed risers, install the takeoff coming out the top of the main pipe.

L. Install strainers on supply side of each control valves, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

M. Anchor piping for proper direction of expansion and contraction.

4.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for Mechanical Piping and Equipment". Comply with requirements below for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable galvanized steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable galvanized roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1.	NPS 3/4	Maximum Span: 7 ft	Minimum rod size: 1/4 inch
2.	NPS 1	Maximum Span: 7 ft	Minimum rod size: 1/4 inch
3.	NPS 1-1/2	Maximum Span: 9 ft	Minimum rod size: 3/8 inch
4.	NPS 2	Maximum Span: 10 ft	Minimum rod size: 3/8 inch

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1.	NPS 3/4	Maximum Span: 5 ft	Minimum rod size: 1/4 inch
2.	NPS 1	Maximum Span: 6 ft	Minimum rod size: 1/4 inch
3.	NPS 1-1/2	Maximum Span: 8 ft	Minimum rod size: 3/8 inch
4.	NPS 2	Maximum Span: 8 ft	Minimum rod size: 3/8 inch

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

4.5 PIPE JOINT CONSTRUCTION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for joint construction requirements for soldered and brazed joints in copper tubing; threaded, welded, and flanged joints in steel piping; and solvent-welded joints for PVC and CPVC piping.

B. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks. Gaskets shall be molded and produced by the coupling manufacturer and shall be verified as suitable for the intended service. A factory-trained field representative (direct employee) of the mechanical joint manufacture shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. The factory-trained representative shall periodically review the product installation and ensure best practices are being followed. Contractor shall remove and replace any improperly installed products. A distributor's representative is not considered qualified to conduct the training.

4.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

4.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be same as for equipment connections

B. Install control valves in accessible locations close to connected equipment.

C. Install ports for pressure and temperature gages at coil inlet connections.

4.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, un-insulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of test liquid.
3. Check expansion tanks to determine that they are not air bound and that system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping".
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

4.9 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments before operating the system:

1. Open valves to fully open position.
2. Check pump for proper direction of rotation.
3. Set automatic fill valves for required system pressure.
4. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Check operation of automatic bypass valves.
7. Check and set operating temperatures of boilers to design requirements.
8. Lubricate motors and bearings.

END OF SECTION 23 2113

SECTION 23 3113 – METAL AND NONMETAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Flexible Class I Air Ductwork.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible duct connections.

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-value): As defined in ASTM C 168. In this section, these values are the result of the formula [(Btu) x (in/hr) x (sq. ft.) x (deg F)] or [(W/m) x (K)] at the temperature differences specified. Values expressed as Btu or W.

1. Example: Apparent Thermal Conductivity (k-value): 0.26 or 0.037.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and distribution equipment and other components of air systems. Changes to layout or configuration of duct system must be specifically approved in writing by Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

1.6 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings from duct fabrication shop, drawn to a scale not smaller than 1/4" equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Indication of ductwork construction materials.
4. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
5. Elevation of top of ducts.
6. Dimensions of main duct runs from building grid lines.
7. Fittings.
8. Reinforcement and spacing.
9. Seam and joint construction.
10. Penetrations through fire-rated and other partitions.
11. Equipment installation based on equipment being used on Project.
12. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
13. Hangers and supports, including methods for duct and building attachment, and vibration isolation.
14. Coordination with building structure and space available based on actual steel shop drawings.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Access panels.
    e. Perimeter moldings.

D. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.7 QUALITY ASSURANCE

A. Comply with NFPA 90B, “Installation of Warm Air Heating and Air Conditioning Systems,” unless otherwise indicated.

B. Comply with SMACNA duct fabrication and installation procedures.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

B. Deliver and store all ductwork so it remains dry and free of any dirt or dust. All ductwork openings, whether in storage or installed prior to system start-up, shall be protected with protective film to prevent interior of ductwork systems from getting dirty. (Trimaco Blue HVAC Film, or equal).

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated. Refer to equipment schedules on Drawings for system operating pressures.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Spiral lockseam duct shall be constructed with an interlocking helical seam that runs the length of the duct. The lockseam shall be formed on the outside of the duct, providing a smooth interior that result in minimal friction loss. This seam shall increase the duct's structural strength and rigidity.

1. Acceptable Product: McGill, Model 'Uni-Seal™'

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE WALL DUCT FABRICATION

A. Double-Wall (Insulated) Ducts: Fabricate double-wall (insulated) ducts with an outer shell and a perforated inner liner. Dimensions indicated on internally insulated ducts are inside dimensions. Double wall ducts shall be paintable galvanized round double wall spiral lockseam construction in accordance with SMACNA standards. Duct shall be continuous, unjoined lengths where possible. Except when interrupted by fittings shall not be less than 12 feet long.

1. Thermal Conductivity (k-Value): 0.27 at 75 deg F mean temperature.
2. Outer Shell: Base outer-shell metal thickness on actual outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner shell and insulation, and in metal thickness specified for single-wall duct.
3. Insulation: 1-inch- thick fibrous-glass insulation, unless otherwise indicated. Terminate insulation where internally insulated duct connects to single-wall duct or uninsulated components. Terminate insulation and reduce outer duct diameter to inner liner diameter.
4. Perforated Inner Liner: Fabricate round inner liners with sheet metal having 3/32-inch diameter perforations, with an overall open area of 23 percent. Use the following sheet metal thicknesses and seam construction:

a. Ducts 3 to 8 inches in Diameter: 0.019 inch with standard spiral seam construction.
b. Ducts 9 to 42 inches in Diameter: 0.019 inch with single-rib spiral seam construction.

5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

B. Acceptable Product: McGill, Model 'Acousti-k27®'

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Flexible Elastomeric (Non-Fibrous) Duct Liner:

1. General Properties:
a. Operating Temperature (max) – ASTM C 411: 180°F.
b. Air Velocity (max) – ASTM C 1071: 10,000 ft/min.
c. Mold Resistance – UL 181: Meets Requirements.
d. Fungi Resistance – ASTM G 21: Meets Requirements.
e. Bacteria Resistance – ASTM G 22: Meets Requirements.
f. Maximum Flame Spread Index - UL 723, NRTL Certified: 25.
g. Maximum Smoke Developed Index - UL 723, NRTL Certified: 50.
h. UL Listed.
i. Microban® Antimicrobial protection.
j. Comply with NAIMA AH124, "Fibrous Glass Duct Liner Installation Standard.

	Sound Absorption Coefficient at Frequency

Sound Absorption Coefficients: Thickness	(Cycles per Second)						
	125	250	500	1000	2000	4000	NRC
1 Inch	0.08	0.22	1.03	0.37	0.68	0.50	0.60

2. Manufacturers: Subject to compliance with requirements, provide products by the following or an approved equal indicating compliance with the above mentions properties and the published sound absorption coefficients for the Acceptable Product, listed below:
   a. Armacell LLC.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
4. Acceptable Product: Armacell, Model 'AP Coilflex™ Conformable Duct Liner'.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   a. Fan discharges.
   b. Intervals of lined duct preceding unlined duct.
   c. Upstream edges of transverse.

8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

E. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.8 FLEXIBLE CLASS I AIR DUCT

A. Flexible air duct systems shall be provided by JP Lamborn Co, or an approved equal. Ductwork systems shall be UL-181 approved for Class I air ducts. Ductwork systems shall meet the requirements of NFPA 90A and 90B and UMC 6-1. This is pre-insulated, round air duct with a reinforced grey polyester outside jacket enclosing fiberglass insulation wrapped around continuous inner air barrier film reinforced with an encapsulated steel wire helix. Installation shall be in accordance with manufacturer's recommendations including hangers and spacing. Maximum allowable length of flexible air duct shall be 6'-0". Install only where indicated on drawings.

1. Insulation Thickness: Insulation thickness and resulting insulation R-Value shall meet all requirements stipulated within Section 23-0700.
2. Acceptable Products:
   a. JP Lamborn Co, Model RPR-25R6 (R-6 Insulation Value).
   b. JP Lamborn Co, Model RPR-25R8 (R-8 Insulation Value).

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness and connective flanging.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Install ductwork so as not to encroach on required clearances above or around electrical panels.

K. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

L. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

M. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Exhaust Ducts: Seal Class C.
4. Unconditioned Space, Return-Air Ducts: Seal Class B.

5. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
6. Conditioned Space, Exhaust Ducts: Seal Class B.
7. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, condensate drain pans, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

D. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.

7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Minimum duct seal level requirements

1. Unless otherwise indicated, construct ducts to the followings static-pressure classifications:
   a. Supply Ducts: 2-inch wg.
   b. Return Ducts: 2 inch wg, negative pressure
   c. Exhaust Ducts: 2-inch wg, negative pressure

C. Internal Duct Liner:

1. Supply, Return, Bathroom Exhaust and Transfer Air Ducts and/or plenums: Flexible elastomeric, 1 inch thick.

D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      1) Radius-to Diameter Ratio: 1.5.
   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.

b. Rectangular Main to Round Branch: Spin in.
1) Acceptable Product: Acme Model No. 176.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
a. Velocity 1000 fpm or Lower: 90-degree tap.

F. Install internal liner on ducts as indicated on the drawings.

G. Duct sizes indicated on the drawings are net free area. Increase duct sizes indicated on the drawings to allow for the internal liner.

H. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

I. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.

J. Butt transverse joints without gaps and coat joint with adhesive.

K. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

L. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

M. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

N. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharge.
2. Intervals of lined duct preceding unlined duct.

O. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

END OF SECTION 23 3113

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Fire and Smoke Dampers.
4. Flange connectors.
5. Louvers.
6. Duct-mounted access doors and panels.
7. Flexible connectors.
8. Flexible ducts.
9. Turning vanes.
10. Duct accessory hardware.
11. Roof Curbs.

B. Related Sections:

1. Division 23 Section "Ductwork".
2. Division 23 Section "HVAC Insulation"

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Manual-volume dampers.
2. Control dampers, including leakage rate data in (cfm/ft^2 @ in. wg).
3. Fire and/or smoke dampers
4. Duct-mounted access doors and panels.
5. Louvers.
6. Access Doors.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
   a. Special fittings and manual- and control-volume damper installations

b. Fire- and/or smoke-damper installations, including detailed installation methods for installing damper/sleeve assemblies within rated construction. Additionally, submit locations and sizes of all access panels installed adjacent to fire and/or smoke dampers.
c. Duct-mounted access doors and remote damper operators.
d. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches

2.2 MANUAL VOLUME DAMPERS – STEEL:

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles, full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Single blade or multiple, opposed-blade design unless otherwise indicated on drawings, standard leakage rating, with linkage outside air stream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 20 gage thick, with mitered and welded corners; frames with flanges for attaching to walls; and flangeless frames for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized, sheet steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.
5. Provide with standoff bracket on ducts that are insulated.

C. Acceptable Volume Damper: www.greenheck.com Greenheck Fan Corporation Model MBD-15 rectangular or MBDR-50 round.

2.3 LOW LEAK CONTROL DAMPERS - STEEL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. McGill AirFlow LLC.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.
6. Vent Products Company, Inc.
7. Young Regulator Company.

B. Damper actuators are specified in section 230900 – “Automatic Control Systems”. The fact that dampers are specified in this section does not preclude the ATC sub-contractor from providing dampers. The determination of who supplies the damper is up to the HC. All damper actuators shall be as specified in section 230900.

C. Low-leakage rating, with linkage outside air stream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

1. Maximum leakage rating: 4 cfm/ft^2 @ 1 in. wg.

D. Frames:

1. Hat shaped.
2. Galvanized steel channels, 0.064 inch thick.
3. Mitered and welded corners.

E. Blades:

1. Blades shall be double-skin, airfoil type.
2. Multiple blades with maximum blade width of 8 inches.
3. Opposed blade design.
4. Galvanized Steel.
5. 0.064 inch thick.

6. Blade Edging: EPDM rubber blade seals.

F. Blade Axles: 1/2-inch diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

G. Bearings:

1. Dampers in ducts with pressure classes of 3-inch wag or less shall have axles, full length of damper blades and bearings at both ends of operating shaft.
2. Thrust bearings at each end of every blade.

H. Acceptable Low Leak Control damper: www.greenheck.com: Greenheck Fan Corporation Model No. VCD-34.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. McGill AirFlow LLC.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Pottorff; a division of PCI Industries, Inc.
6. Prefco; Perfect Air Control, Inc.
7. Ruskin Company.

B. General: All fire dampers shall be of the dynamic closure type. They shall have been successfully tested to U.L. Standard 555 - 4th Edition as to their ability to close under dynamic airflow conditions and they shall bear the U.L. label stating that they are suitable for that applicable. Dynamic closure fire dampers shall have been successfully tested in both horizontal and vertical mounting positions and to maximum static pressures of 8” w.g. Dynamic closure fire dampers shall be installed in accordance with the manufacturer’s instruction. All fire dampers shall meet the requirements of NFPA-90A.

C. Fire Rating: 1-1/2 and/or 3 hours. Refer to architectural drawings for locations of each rated assembly.

D. Frame: Type B, Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Fire dampers shall be factory installed within mounting sleeve unless otherwise indicated. Mounting sleeves shall be fabricated of galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as required, and of length to suit application.

2. Mounting sleeve shall incorporate a factory-installed access door. Door shall be located on appropriate side of fire damper to allow for easy access and service to fusible linkage.
3. Mounting sleeve shall be provided with flanged, breakaway-type fitting for connection to adjacent ductwork.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Heat-Responsive Device: Replaceable, 165 deg F or 212 deg F rated fusible links.

J. Acceptable Dynamic Fire Damper: www.greenheck.com: Greenheck Fan Corporation Model No. DFD-150X Type B.

K. Damper Manufacturer Supplied Damper Retaining Angle: 16 Ga. Galvanized Steel, 1 ½" x 1 ½", or 1 ½" x 2 ½" for sizes greater than 48".

1. Acceptable Damper Retaining Angle: www.greenheck.com Greenheck Fan Corporation Model No. POC.

2.5 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

F. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.

I. Leakage: Class I.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as required, and of length to suit application.
2. Mounting sleeve shall also incorporate a factory installed access door. Door shall be located on appropriate side of damper to allow for easy access and service.

L. Damper Motors: Two-position action.

M. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Electrical Requirements for Mechanical Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 23 Section "Automatic Temperature Control".
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Non-spring-Return Motors: For dampers larger than 25 sq. ft, size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

N. Accessories:

1. Auxiliary switches for signaling or position indication.
2. Momentary test switch; remote mounted.
3. Resettable linkage with open close indicator
4. Temperature override

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Provide material compatible with duct materials.

D. Gage and Shape: Match connecting ductwork.

2.7 LOUVERS

A. Furnish and install in all openings as indicated on the drawings, stationary, extruded aluminum louvers with drainable blades in a 6" frame. Louvers shall have an aluminum blade thickness of .018" and shall have a 45° blade angle. Heads, sills and jambs to be one piece extruded structural members in 6063-T5 alloy. Blades to have continuous reinforcing bosses on underside.

B. Provide concealed mullions employing an extruded concealed blade brace of the same material as the louvers.

C. Provide half inch (.063) mesh expanded framed aluminum bird screen on the inside of the louver. The bird screen shall have a minimum free area equal to 80% of the gross area.

D. All louvers shall be provided in a factory applied baked enamel finish. Color selection will be performed during the shop drawing phase. Provide color samples, from standard chart, with shop drawing submittal.

E. Acceptable Louvers: www.greenheck.com Greenheck Fan Corporation Model No. ESD-435 or equivalent by Pottorff, Nailor, or Ruskin.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Acudor Products, Inc.
3. Ductmate Industries, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff; a division of PCI Industries, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
   a. Double wall, rectangular.

b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
   d. Access Doors Larger than 24 by 48 inches: Four hinges and two compression latches with outside and inside handles.
4. Acceptable Duct-Mounted Access Door: www.acudor.com: Acudor Model No. HD-5070

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.10 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with the International Energy Conservation Code
5. Acceptable Product: www.flexmasterusa.com: Flexmaster USA Product No. Type 5B Flex Duct.

C. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches to suit duct size.

2.11 ROOF CURBS

A. Roof curbs for HVAC equipment shall be seismically rated and capable of wind loads.

B. Curbs for lighter equipment such as exhaust fans and duct penetrations shall be similar to Thycurb model TC-3.

1. Prefabricated roof curbs to be of prime galvanized steel construction, 18 or 14 gauge as required, meeting ASTM A-446, 525, 526 & 527, with welded corners and seams joined by continuous welds. Curbs to be internally reinforced, factory insulated with 1-1/2" thick 3# density fiberglass insulation, and factory installed wood nailers fastened from underside with Tek screws. Height to be 12" above roof deck or as detailed. Top of all roof curbs shall be level, with pitch built into curb when deck slopes 1/4 of an inch per foot or greater. Roof curbs shall be as manufactured by ThyCurb Fabricating Division of ThyBar Corporation, or approved equal.

C. Support rails for equipment.

1. Prefabricated equipment mounting supports to be of prime galvanized steel construction, 18 or 14 gauge as required, meeting ASTM A-446, 525, 526, & 527, with welded corners with seams joined by continuous welds. Supports shall be internally reinforced with bulkheads and spreaders 24" on center, have factory installed 2 x 4 or 2 x 6 wood nailer and 18 ga. counterflashing. Certified locate bearing data shall be provided. Height to be a minimum of 8" above roof deck or as detailed. Equipment supports shall span a minimum of two (2) joists and not cantilever more than 12". Support shall be level at the top with pitch built-in when deck slopes 1/4 of an inch per foot or greater, or as detailed. Equipment mounting supports to be as manufactured by ThyCurb Fabricating Division of ThyBar Corporation, or approved equal.

D. Pipe curbs shall be Thycurb model TCC-1, TCC-3, or TCC-5 depending on the number of pipe and conduits penetrating the roof. Provide each opening with an ABS thermoplastic korad acrylic cover boot with stainless steel clamps top and bottom.

E. Provide each opening with a Dektite flashing boot for metal roofing systems.

2.12 TURNING VANES

A. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

B. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

C. Where indicated on drawings, provide full radius turning vanes constructed of sheet metal the same gage of the ductwork.

2.13 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel.

C. Low leak dampers shall be used when separating conditioned air and outside ambient air and as follows:

1. Provide low leak dampers in the duct or fan throat for all exhaust fans or where indicated on the drawings.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Dampers are to be installed at a minimum of two duct diameters from fitting. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install turning vanes so that the leading and trailing edges are in the direction of the desired airflow direction.

H. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.
2. Install fire dampers with angle frames, breakaway duct joint, and penetration sealant to maintain UL rating of the assembly.
3. Install thermal blanket on all ceiling diffusers and grilles where ceiling fire dampers are installed.

I. Refer to Architectural drawings for location of all smoke partitions and fire rated assemblies and their respective UL rating. Install fire dampers that are compatible with these rating, in ducts that penetrate these walls, floors, and ceilings. Install smoke dampers in all ducts that penetrate smoke partitions. The contractor shall be responsible to install all required fire and smoke dampers whether indicated on the HVAC drawings or not.

J. Duct Fire Damper Schedule: (Low and Medium Velocity)

1. Rectangular ducts with vertical dimension up to 18” height: Type B
2. Rectangular ducts with vertical dimension over 18” height. Type A *Slimline
3. Round and oval ducts. Type C

K. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. At drain pans and seals.
2. Downstream from control dampers, backdraft dampers, and equipment.
3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. At each change in direction and at maximum 50-foot spacing.
5. Upstream and downstream from turning vanes.
6. Control devices requiring inspection.
7. Elsewhere as indicated.

L. Install access doors with swing against duct static pressure.

M. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

N. Install flexible connectors to connect ducts to equipment.

O. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

Q. Connect flexible ducts to metal ducts with draw bands.

R. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

3.3 ROOF CURBS

A. Provide roof curbs for all equipment mounted on the roof, all ductwork penetrations, and pipe penetrations. Curb installation is by this contractor. Flashing will be performed by the GC for all new construction. On existing roofs where new curbs are to be installed the flashing shall be performed as a part of this contractor's work by a certified roofing contractor for the type of roofing system in place. Any roof warranties in place shall be maintained. All curbs shall be Thycurb or equivalent as specified.

END OF SECTION 23 3300

SECTION 23 7413 – OUTDOOR - DOAS AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) used as DOAS units with the following components and accessories:

1. Packaged rooftop air conditioning unit with total energy recovery wheel and gas heat.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. RTU: Rooftop unit. As used in this Section, this abbreviation means outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

D. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

E. Supply-Air Coil: Coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design RTU supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Wind-Restraint Performance:

1. Basic Wind Speed: Per IBC
2. Building Risk Category: III
3. Minimum 10 lb/sq. ft (48.8 kg/sq. m) multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

4. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for selecting wind restraints.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
3. Wind Restraint Details: Detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance:

1. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
2. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 WARRANTY

A. Provide parts warranty (excluding refrigerant) for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide five-year extended warranty for compressors.

C. Warranty Period for Gas Furnace Heat Exchangers: Not less than ten years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: one set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide Aaon or a comparable product by one of the following:

1. Daikin
2. Valent

2.2 DRAWING SCHEDULE

A. The equipment schedule on the drawings shall be a part of this specification. The equipment specified shall be a basis of the level of quality intended.

2.3 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Paint finish shall be capable of withstanding at least 2500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure. Paint color to be custom color selected by the Architect during the shop drawing phase.
7. Unit specific color coded wiring diagrams shall match the unit color coded wiring and shall be provided in both point-to-point and ladder form.
8. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
9. Access to filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with quarter turn latches. Door fastening screws are not acceptable.
10. Access doors shall have stainless steel hinges and full perimeter gasketing.
11. All openings through the base pan of the unit shall have upturned flanges of at least 1/2" in height around the opening through the base pan.
12. Air side service access doors shall have rain break overhangs.
13. All access doors shall have an internal metal liner to protect the insulation.
14. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit.
15. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit. Cabinet to also include:
    a. Unit exterior to be painted galvanized sheet metal. Paint color to be standard color selected by the Engineering during the shop drawing phase.
    b. Double wall insulation liners: walls, roof, roof.
    c. Base pan insulation for all units even if mounted on a curb.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.4 FANS

A. Direct-Driven Fans: Double width centrifugal; with permanently lubricated, ECM motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

2.5 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Venting: Gravity vented

E. Safety Controls:

1. Gas Control Valve: Modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.6 EVAPORATOR COIL

A. Provide configured aluminum fin surface mechanically bonded to copper tubing coil.

B. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 450 psig and leak tested at 200 psig.

C. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

2.7 CONDENSER SECTION

A. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

2.8 REFRIGERATION SYSTEM

A. Compressors: Provide scroll compressor with direct drive operating at 3600 rpm. Integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads.

B. Units shall have cooling capabilities down to 0 degree F as standard.

C. Provide each unit with two refrigerant circuits factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

2.9 EXHAUST/RETURN SECTION

A. Provide a factory supplied barometric relief damper in the economizer section for relieving building pressurization.

2.10 OUTDOOR AIR SECTION

A. Provide economizer with single enthalpy control and barometric relief.

B. Provide spring return motorized damper for outside air damper closure during unit shutdown or power interruption.

2.11 CONTROLS

A. Control equipment and sequence of operation are specified in Division 23 Sections 23 0900 & 23 0901.

2.12 ENERGY RECOVERY WHEEL

A. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.

B. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.

C. Wheel shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.

D. Wheel shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.

E. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

F. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

G. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts

warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.

H. Unit shall include, pleated panel outside air filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the wheels.

I. Hinged service access doors shall allow access to the wheel.

J. Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

2.13 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

2.14 DAMPERS

A. Return and Outdoor-Air Damper: Linked damper blades, for 0 to 100 percent air flow, with motorized actuator

2.15 CONTROLS

A. Control equipment and sequence of operation are specified in Division 23 Section "Instrumentation and Control for HVAC."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." [ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Install wind restraints according to manufacturer's written instructions.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to coils and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Remove packing from vibration isolators.
10. Inspect operation of dampers.
11. Verify lubrication on fan and motor bearings.
12. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
13. Inspect ERV wheel for rotation.
14. Start unit according to manufacturer's written instructions.
    a. Start hot and chilled water flow.
    b. Complete startup sheets and attach copy with Contractor's startup report.
15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Calibrate thermostats.
18. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
19. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
    a. Supply-air volume.
    b. Return-air volume.
    c. Outdoor-air intake volume.
20. Simulate maximum cooling demand and inspect the following:
21. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain DOASs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 7413

SECTION 23 8500 – HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes basic requirements for various types of HVAC equipment;

1. Exhaust fans
2. Ductless mini-split AC units
3. Dehumidification Units
4. Kitchen Hood
5. Humidifiers
6. Unit Heaters
7. Baseboard
8. Cabinet Heaters
9. Destratification Fans

B. Refer to equipment schedules on the Drawings for capacities and required accessories and options for each type of equipment.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists.

D. Maintenance Data: For equipment to include in the maintenance manuals specified in Division 1.

E. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Comply with AGA Z223.1 for gas-fired furnace section.

F. Comply with NFPA 70.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver units as factory-assembled units with protective crating and covering.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

D. Do not use the crane to rig equipment when the building is in operation. All crane operations shall be done after normal hours of operation.

1.5 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, pads, and roof penetrations with general construction.

1.6 WARRANTY

A. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of Substantial Completion.
2. Warranty Period, Heat Exchangers: Manufacturers standard, but not less than 10 years after date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Filters: One operating set and one spare set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The design layout is based on the specified units. Subject to the compliance with these specifications other manufacturers may provide equivalent products provided they meet the intent of the specifications; however, in the event that incorporation of an equivalent item or assembly into the work will require revisions or additions to the requirements of other contracts, the Contractor must coordinate their installation and bear all costs of revisions or additions to the work, including costs to other contractors, at no charge in the Contract Sum.

2.2 ELECTRICAL

A. Construct and test units according to NEC and UL, ETL or other NRTL and list the entire unit. Listing of electrical panel only is unacceptable. All major electrical components shall be UL listed. Factory wire unit for single point power connection. Enclose all power wiring in liquid tight conduit.

B. Provide non-fused disconnect, fan motor starters/protectors, contactors, control transformer, control circuit fusing, service switch, and terminal block. Unit shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage, or the voltage is more than 10% under design voltage or on phase reversal.

C. Where indicated, provide a service receptacle powered on the line-side of the main disconnect with a separate disconnect, fuses and 120v transformer.

2.3 CONTROLS AND WIRING

A. Where specified, all operating controls shall be furnished by the equipment manufacturer and/or the temperature control system contractor/sub-contractor to interface directly to each unit.

B. Refer to Drawings or temperature control specifications for further information on the controls and sequences of operation.

2.4 ROOF CURBS AND SUPPORTS

A. Where specified, provide roof curbs or equipment rails sized to match equipment. Provide wind or seismic-rated equipment curbs where specified; refer to details on the Drawings.

B. Provide acoustical sound blankets within rooftop unit curb for sound attenuating purposes where specified; refer to details on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roof for compliance with requirements for conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Install units level and plumb, maintaining manufacturer's recommended clearances.

C. Mount units on curbs or rails as indicated. Attach curbs or rails to structure.

D. Provide all roof work and flashing.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping to allow service and maintenance.
2. Install condensate drain piping with trapped connection; include union and cleanout plug.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at roof curb or directly to equipment.
2. Where indicated, return-air duct through roof structure and terminate open end in ceiling plenum. Insulate space between roof and bottom of unit.

C. Electrical: Conform to applicable requirements in Division 26 Sections.

3.4 COMMISSIONING

A. Verify that installation is as indicated and specified.

B. Complete manufacturer's installation and startup checks and perform the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, air-cooled condenser coil, and fans.
4. Verify that clearances have been provided for servicing.
5. Check that labels are clearly visible.
6. Verify that controls are connected and operable.
7. Remove shipping bolts, blocks, and tie-down straps.
8. Verify that filters are installed.
9. Adjust vibration isolators.
10. Check operation of dampers.
11. Lubricate bearings on fan.
12. Check fan-wheel rotation for correct direction without vibration and binding.

C. Start unit according to manufacturer's written instructions.

1. Complete startup sheets and attach copy with Contractor's startup report.

2. Check and record performance of interlocks and protection devices; verify sequences.
3. Operate unit for an initial period as recommended or required by manufacturer.
4. Calibrate and adjust thermostats.
5. Adjust and check high-temperature limits.
6. Check controls for correct sequencing of heating/cooling, mixing dampers, refrigeration, and normal and emergency shutdown.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
2. Review data in the maintenance manuals.
3. Review data in the maintenance manuals.
4. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION 23 8500

SECTION 26 0010 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Sections and Division 1 Specifications Sections, apply to this and the other sections of Division 26.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for Electrical, Communications, and Safety/Security system installations. It is intended to supplement Division 1 sections. Any conflicts shall be brought to the attention of the Architect/Engineer for clarification.

B. Furnish and install all work indicated and specified in accordance with these specifications and accompanying contract drawings. This shall include all required labor, materials, equipment, programming, testing, and supervision.

1.3 DEFINITIONS

A. The following definitions used in mechanical and electrical sections are in addition to those listed in Supplementary General Conditions:

1. Provide: Shall mean "furnish and install" indicated work
2. Install: Installation of item and all necessary related work to provide fully operational devices.
3. Furnish: Procurement and delivery to jobsite of equipment for installation.
4. Remove: Disconnect and take from existing location, including accompanying sealant, supports, anchors, and associated materials, and remove from the site for legal disposal or recycling, or store and protect for reinstallation when noted.
5. Replace: Remove and provide new.
6. Re-install: Install existing item in same or new location as indicated. Provide all necessary hardware, supports, extension of existing services, etc as required.
7. Herein: shall mean the contents of a particular section where this term appears.
8. Indicated: Indicated on contract drawings.
9. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, unpainted storage areas without ceilings, chases and shafts, attics, ceiling plenums, unexcavated spaces, crawl spaces, and tunnels.
10. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
11. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
12. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in walls or shafts.
13. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to

outdoor ambient temperatures. Examples include installations within unheated shelters.

14. Listed or labeled shall mean as defined in NFPA 70 Article 100, by a Testing Agency acceptable to Authorities having jurisdiction (AHJ) and marked for intended use.
15. Piping: Includes pipe, fittings, valves, hangers, and other accessories which comprise a system.
16. Wiring: Conduit, fittings, wire, junction and outlet boxes, switches, and items necessary or relating to such wiring.
17. Work: The labor, equipment, and materials required as part of the project.
18. Trades: refers to those specifically skilled in the work performed under a particular section of this contract.
19. General Contractor/G.C.: shall mean that contractor responsible for the work of Divisions 2 through 14 and 31 through 33 inclusive.
20. Fire Protection Contractor/F.C. shall mean the contractor or sub-contractor responsible for the Fire Protection work described work in Division 21 and indicated on the Fire Protection drawings. Some general construction work may pertain to this work.
21. Plumbing Contractor/P.C. shall mean the contractor or sub-contractor responsible for the Plumbing work described in Divisions 21 and 22 and indicated on the plumbing drawings. Some general construction work may pertain to this work.
22. Mechanical Contractor/M.C. shall mean the contractor or sub-contractor responsible for the work described in Division 23 and indicated on the mechanical drawings. Some general construction work may pertain to this work.
23. Electrical Contractor/E.C. shall mean the contractor or sub-contractor responsible for the work described in Division 26, 27, and 28 and indicated on the electrical drawings. Some general construction work may pertain to this work.

1.4 CONTRACTOR

A. The term Contractor as used throughout this Division of the Specifications shall be understood to mean the Electrical Contractor or firm awarded the Contract for the Electrical work. For projects with one prime contractor, Electrical Contractor shall be understood to mean the sub-contractor to the prime Contractor.

1.5 DRAWINGS

A. The Electrical work is generally indicated on the Electrical Drawings, but additional related information and details may appear on other project drawings, and these shall become a part of each Contract. All project drawings are intended to be complimentary.

1. Refer to the Architectural drawings, when applicable, for information such as locations of fire rated assemblies, ceiling types and heights, chase dimensions, structural steel dimensions, etc.
2. The Architectural Drawings and details shall govern the location and arrangement of equipment, mounting heights, and similar conditions within finished spaces.
3. Notify the Architect of any discrepancies between any of the drawings and/or the specifications.

B. The Drawings are diagrammatic in nature and indicate the general configuration of the work. All work that will be required for the actual installation is not necessarily indicated due to the scale of the drawings. Coordinate the actual installation of all work with all other building system components and other Contractors, and provide all necessary coordination, offsets, accessories, materials, etc. as part of the work.

1.6 TRUE INTENT

A. The Drawings and Specifications are intended to describe a complete operating system. All labor, material or equipment, which is not specified or indicated but is necessary for the operation and completion of a properly operating system, according to the true intent of the Specifications and Drawings and as interpreted by the Architect/Engineer, shall be furnished as a part of the Contract, as though it were specifically detailed and described.

B. Coordinate and assign work such that all work and materials are provided and coordinated between all subcontractors and suppliers to provide complete and operational systems. The specification format, section numbers and drawing numbering or nomenclature is not intended to assign work within the Contract.

1.7 EXAMINATION OF THE SITE

A. Bidders shall carefully examine specifications and drawings, visit the site of proposed work and observe all existing conditions and limitations, and include any work required due to the existing conditions and limitations.

B. Request clarifications from the Architect/Engineer regarding discrepancies between existing conditions and drawings and specifications prior to bidding. Submission of a bid shall indicate that bidder is familiar with existing conditions to be met in execution of the work and has included such work in his bid.

1.8 DIMENSIONS, GRADES AND SURVEYS

A. Dimensions, grades, elevations and locations shown on the Drawings are approximate. Verify all lines, grades and dimensions prior to starting the work. All necessary measurements, surveys, lines, grades, and elevations are the responsibility of the Contractor. Verify all lines and grades with the local controlling agency, AHJ or other party where required.

1.9 PERMITS, FEES AND CODES

A. Unless otherwise directed, Contractor shall obtain and pay for all third-party review fees, building permits, inspections, tests, and certificates relating to the work as required by any of the Authorities Having Jurisdiction. All inspection certificates shall be delivered to the Architect/Engineer and become property of the Owner.

B. Perform all work in compliance with the codes, laws, ordinances, rules or regulations of federal, state, or local Authorities Having Jurisdiction over the premises. All such codes, laws, ordinances, rules and regulations are hereby incorporated and made a part of these specifications.

C. Work shall be done in accordance with, but not limited to, the applicable sections of the latest edition and supplement to the following Codes and Standards:

1. ANSI American National Standard Institute
2. ASTM American Society for Testing and Materials
3. FM Factory Mutual Systems
4. FS Federal Specification
5. IEEE Institute of Electrical and Electronics Engineers
6. MIL Military Specification
7. NEMA National Electrical Manufacturers Association
8. NFPA National Fire Protection Association
9. UL Underwriters Laboratories, Inc.
10. IBC International Building Code
11. NEC National Electric Code
12. All relevant sub-codes adopted by the local AHJ.

D. The drawings and specifications are not intended to conflict with the above documents. Request clarifications from the Architect/Engineer regarding discrepancies between relevant codes and the drawings and specifications prior to bidding. Submission of a bid shall indicate that bidder is familiar with the applicable code requirements and has included such work in the bid.

E. All work performed on this project and all equipment furnished for this project shall be in conformance with the regulations and requirements of the Occupational Safety and Health Act (OSHA). The Contractor is solely responsible for compliance with OSHA regulations. All purchased equipment shall be designed, manufactured, and furnished with the necessary accessories to meet OSHA requirements. All construction facilities, including ladders, platforms, guard rails, safety features, etc. shall meet OSHA requirements.

1.10 DAMAGES

A. Contractor is responsible to repair or replace damage caused by employees or sub-contractors to the site, building or building mechanical/electrical systems during the execution of the work. Repairs or replacement shall be completed to the satisfaction of the Architect/Engineer and Owner.

B. The above paragraph applies to damages which occur to existing conditions (portions of the building in place before renovations) or new work installed during the progress of the project.

1.11 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new, and shall conform to the grade, quality and standards specified. All equipment shall be limited to products regularly produced for the intended service, in accordance with manufacturer's engineering data, rating, and literature. Major items of equipment shall be manufactured for the intended purpose in commercial practice and shall have the manufacturer's name, address and catalog number affixed in a prominent place.

C. Equipment shall be installed in strict accordance with manufacturer's instructions for type and capacity of equipment used. Manufacturer's instructions shall be considered part of the specifications. Type, capacity and application of equipment shall be suitable and shall operate satisfactorily for the purpose intended.

D. Equipment used as the basis-of-design as indicated on the Drawings defines the general space requirements, weights and related services (electrical services, piping connections, etc.). Provide equipment of similar size, requirements and clearances which shall not necessitate revisions to the building construction or other trades. If revisions are required due to substitution the Contractor shall pay all costs for any required revisions. No revisions shall be made without Architect/Engineer's written approval.

1.12 PERFORMANCE OF EQUIPMENT

A. All materials, equipment and systems specified or required for the completion of the work, shall be completely satisfactory and acceptable in operation, performance, and capacity. No approval, either written or verbal, of any drawings, descriptive data of samples of such material, equipment and/or appurtenances, shall relieve the Contractor of his responsibility to provide systems in complete working order at the completion of the work.

B. Any material, equipment, or appurtenances, which does not comply with the drawings and/or specification requirements, or which is not new, or which is damaged prior to acceptance by the Architect/Engineer, shall be removed and replaced with acceptable materials, equipment and/or appurtenance or put in acceptable working condition, to the satisfaction of the Architect/Engineer.

C. All equipment and systems shall be electrically and mechanically correct. All equipment and systems shall operate without objectionable noise or vibration as determined by the Architect/Engineer. Eliminate any objectionable noise or vibration produced and transmitted to occupied portions of the building by any system or equipment, to the satisfaction of the Architect/Engineer and Owner.

1.13 CUTTING AND PATCHING

A. New Construction: Each Contractor shall furnish complete information as to size and exact location of openings and/or sleeves required in new floors, walls, or roofs to the General Contractor or applicable sub-contractor(s) such that openings are provided in new construction as the work progresses.

1. Supports: The General Contractor will provide framed roof or floor openings and lintels in new masonry walls.
2. Roofing: The General Contractor will provide roof flashing work in conjunction with the project's roofing installation.
3. If openings are omitted or are incorrect through failure to follow these instructions, the Contractor shall be responsible for cutting and patching of the construction in a manner approved by the Architect/Engineer.

B. Existing Construction: Each Contractor shall cut and patch existing building construction as required for the installation of new work, unless otherwise noted. All cutting and openings shall be approved by the Architect/Engineer.

1. Patching: All patching of existing surfaces shall match the existing construction finish.
2. Supports: All openings made in existing floors, walls, roof decks, etc. shall be supported in a manner approved by the Architect/Engineer to maintain the structural integrity of the construction. The Contractor shall provide lintels in all masonry wall openings and structural steel angle framed openings for all roof and floor penetrations. Submit drawings depicting each framed opening and lintel size, type, and location to the Architect/Engineer for review and acceptance.
3. Roof Work: Cutting and patching of the existing roof as required to install new systems and equipment, and/or the removal of existing systems, shall be performed by an approved and certified roofing contractor. Patching and flashing of the existing roof shall be made with materials and methods certified by the existing roofing manufacturer.
    a. Warranty: Roofing work shall be performed by a contractor approved by the existing roofing manufacturer in order to maintain the existing roofing warranty.

C. General: All cutting and patching shall be done by mechanics experienced in their respective lines of work.

1. All cutting shall minimize damage to adjacent surfaces. If damage occurs the Contractor shall replace or repair the damaged materials with new materials in a manner approved by the Architect/Engineer.
2. When necessary to cut and remove portions of any walls, floors, ceilings, roof or sitework to perform the work, Contractor shall perform cutting and fitting, remove all excess material, and patch or replace all damaged construction in a manner approved by the Architect/Engineer.
3. No cutting shall be done which may affect the building structurally or architecturally. Any damage incidental to cutting or other causes in the performance of this Contract shall be made good by replacement or repairs. Cutting shall be done only with the prior approval of the Architect
4. Patch all openings left in existing walls, floors and ceilings when obsolete materials are removed. Match adjacent construction and finishes.

D. Patch and/or seal all openings or penetrations made in fire rated floors, ceilings or partitions after work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material. All fire sealant material shall be U.L. classified and approved by the Architect/Engineer.

1.14 RUBBISH REMOVAL AND CLEAN-UP

A. Periodically, and at the completion of the work, remove from the building and site all rubbish and accumulated materials, and leave the workplace in a clean, orderly and acceptable condition. Provide dumpsters, trash containers, hauling and approved disposal fees associated with the work.

B. Clean all installed materials and equipment of paint splashes, grease stains, dust, finger marks, and all other unsightly marks prior to substantial completion inspection.

C. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management.TESTS AND CERTIFICATIONS

A. The following requirements are supplementary to test requirements specified in individual equipment or systems Sections.

1. Written notice of test date shall be given to Architect/Engineer and other parties at least 72 hours prior to tests.
2. Concealed work shall remain uncovered until required tests have been completed
3. Conduct preliminary test of equipment as soon as conditions permit. Make changes, adjustments, or replacements based on test results prior to final acceptance tests.
4. Conduct performance and operating tests for each system or equipment in presence of the Architect/Engineer. Coordinate testing with the manufacturer's representative and/or AHJ when required.
5. Furnish labor, material, and instruments and include all other costs in connection with tests.
6. Obtain certificates of approval and/or acceptance in compliance with regulations of AHJ. Work shall not be complete until such certificates have been delivered to the Architect/Engineer and Owner.

B. Contractor shall certify after testing that all systems and equipment operate safely, efficiently, and in accordance with manufacturer's instructions and the intent of the drawings and specifications.

1.16 PROTECTION AND CLEANING

A. Protect work and materials against dirt, water, chemicals, plaster or damage. All openings in stored or installed materials (pipes, ductwork, conduit, etc.), shall be sealed to exclude dirt, sand, and other foreign substances. Any damaged materials shall be removed and replaced regardless of the cause of the damage.

B. Protect all surfaces against damage from welding, cutting, burning, soldering or similar construction functions. Special care shall be directed to exposed finished masonry, metal or wood surfaces, painted surfaces, finished flooring, and finished ceilings.

C. Any damage caused by Contractor's neglect or by the elements due to the Contractor's neglect, either to existing work, or to his work or to the work of any other Contractor, shall be repaired or replaced in a manner approved by the Architect/Engineer.

D. Clean all materials and equipment to remove all paint, grease, oil, scale, rust, dirt, mud, dust, sand, and other foreign material prior to substantial completion inspection. Remove traces of any cleaning materials. Clean the interior of all cabinets, fixtures and equipment and remove dust, dirt and debris.

1.17 QUALITY OF WORKMANSHIP

A. All work shall be installed in a first class, neat and workmanlike manner by mechanics skilled in the trade involved. The quality of workmanship shall be subject to the approval of the Architect/Engineer. Any work of inferior quality and/or workmanship shall be corrected in a manner acceptable to the Architect/Engineer.

1.18 SUBSTITUTIONS

A. Various products are used as the Basis-of-Design for systems and equipment and are specified by a manufacturer's name and model number. Unless otherwise indicated, other manufacturer's products may be submitted for consideration as a substitution in accordance with the requirements set forth in Instructions to Bidders and/or Division 1 sections, and as follows.

1. The Architect/Engineer shall be the sole judge as to the acceptance of a product that is submitted for acceptance as a substitution
2. The proposed substitute shall include all labor and materials required to install and operate the equipment in accordance with the original design concept, including the cost of any changes to work under this section, or other sections or Contracts, such as; access openings, equipment pads, supports, pipe or duct connections, motors, controls, electrical and control wiring.
3. Contractor shall verify that substitute equipment will fit into the designated spaces, verify that dimensions provide adequate space for the equipment and allow clearances for connections and servicing, and verify acceptance of any additional costs from other Contractors resulting from the substitute product, prior to submission to the Architect/Engineer for acceptance.

1.19 SUBMITTALS AND SHOP DRAWINGS

A. General: Follow the procedures specified in Division 1 "Submittals".

B. Prepare and submit a Submittal Schedule which shall include a list of products to be submitted and indicate the product manufacturer, model, and date the information will be submitted to the Architect/Engineer. The schedule shall be submitted within two weeks after notice-to-proceed and prior to the submission of individual product submittals.

C. After acceptance of the Submittal Schedule, submit Shop Drawings and Submittals and obtain acceptance of the Architect/Engineer before any equipment is ordered or work is accomplished. Verify the required number of copies of each submittal to be submitted.

1. Submittals shall be in the form of clearly legible manufacturers printed catalogs, CAD-generated drawings, pamphlets, technical data, test information, and installation instructions. Clearly indicate the location, service and function of each particular item. Identification shall be made in ink with specific model numbers highlighted and accessories highlighted.
2. Submittals shall be completely referenced and identified. Descriptive information and data shall be complete. Submittals which only show partial or general information will not be acceptable and will be returned.

3. Shop Drawings and Submittals which are prepared by sub-contractors and vendors shall be checked and coordinated by the Contractor prior to submission to the Architect/Engineer. Contractor shall check these drawings and submittals with respect to measurements, materials, identifications, and details so as to make certain that they conform to the intent of the Contract Documents and make any corrections before submission to the Architect/Engineer.
4. Contractor shall inform the Design Professional, in writing, of any deviations in the Shop Drawings and Submittals where such deviations are a departure from the Contract Documents. This written advisory shall accompany the initial submittal and shall state the reasons for the deviations. The Contractor shall bear full responsibility for any deviations in the shop drawings and/or submittals that depart from the Contract Documents that have not been specifically brought to the attention of the Design Professional which cause a detriment to the project – regardless of the review status of the Design Professional.

D. The Architect/Engineer will check the Shop Drawings and Submittals for conformance with the Contract Documents. The Engineer's acceptance of the Shop Drawings and Submittals does not release the Contractor from providing all specific requirements of the equipment and installation not listed in the Submittal but required by the Contract Documents.

E. Contractor shall be responsible for dimensions that are to be confirmed at the job site, for coordination in the ordering and assembly of systems and equipment, for information that pertains solely to fabrication processes or to techniques of construction, and for coordination of the work of all trades.

F. The following specific items and information shall be included in all Shop Drawings and Submittals:

1. Capacity and performance data as shown on the Equipment Schedules or as specified.
2. Complete descriptive data on the systems, equipment and specialties which are specified, scheduled, or shown, so that compliance with the Contract Documents can be determined.
3. Electrical wiring diagrams (power and control) for electric motor driven equipment.

G. Systems and equipment which have been installed without having been accepted by the Architect/Engineer may be rejected and be shall be replaced with products that are acceptable. Submittals and Shop Drawings used at the construction site shall have Architect/Engineer's acceptance stamp.

H. Shop Drawings and Submittals shall be revised and submitted as often as necessary to obtain acceptance. Contractor shall not delay the progress of the work due to unnecessary delays in obtaining acceptance of all required Shop Drawings or Submittals.

1. Resubmit rejected Shop Drawings and Submittals within three weeks, or sooner if required by project schedule.
2. During the submittal process, obtain all of the information that will be required for the Operation and Maintenance Manuals.

1.20 COORDINATION AND COORDINATION DRAWINGS

A. General: Follow the procedures specified in Division 1 “Coordination Drawings”.

B. All Contractors and sub-contractors shall coordinate the installation of all equipment and material. The Contractors shall hold weekly coordination meetings during the construction process. If conflicts are found, and they cannot be worked out in the field, they shall be brought to the attention of the Architect/Engineer.

C. Layout of building systems, equipment, fixtures, piping, ductwork, conduit, specialty items, and accessories indicated on the Contract Drawings is diagrammatic. Variations in alignment, elevation, and detail will be required to avoid interference and satisfy architectural and structural limitations. All such variations are not necessarily indicated.

D. Coordination drawings shall be prepared, reviewed and coordinated in advance of any work being performed in any area. The drawings and coordination shall follow the project phasing schedule where applicable.

1. A coordination drawing completion schedule shall be prepared by the Mechanical Contractor and agreed upon by all Contractors and sub-contractors. The initial coordination drawings shall be prepared within thirty days of receipt of the General Contractor’s base ceiling drawings.
2. Upon completion and sign-off by all Contractors, submit final coordination drawings to Architect/Engineer for review and acceptance.

E. Prepare coordination drawings, using AutoCAD, to a scale of 1/4"=1'-0" or larger; detailing all elements, components, and systems of equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Prepare plans, sections and elevations to indicate the proposed locations of fixtures, piping, ductwork, conduit, equipment, and materials. Include the following:
   a. Clearances for installing and maintaining insulation.
   b. Clearances for servicing and maintaining equipment, including access door openings and component removal
   c. Equipment connections, mounting and support details.
   d. Exterior wall and foundation penetrations.
   e. Fire-rated wall and floor penetrations.
   f. Sizes and locations of equipment pads and bases.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Order of priority for construction space:
   a. Maintain scheduled finished ceiling height.
   b. Light fixtures
   c. Drainage piping (gravity flow).
   d. Ductwork.
   e. Cable trays
   f. Fire protection piping.

g. Other piping.
h. Conduit.

F. Prepare overall coordinated reflected ceiling plans which shall include, but not be limited to, air outlets and inlets, light fixtures, communication systems components, sprinklers, access doors, and other ceiling-mounted equipment or items.

1. The General Contractor shall prepare the base ceiling plans. Each contractor shall use these base ceiling drawings to indicate their work on a composite reflected ceiling plan. The Mechanical Contractor shall obtain copies of the General Contractor's base ceiling plans, and copies all other contractors' or sub-contractors' reflected plans and use them to prepare composite plans
2. All Contractors and sub-contractors shall carefully check all the drawings and coordinate their work with all other trades to provide a symmetrical and coordinated ceiling. Ceiling T-bars, lights, diffusers, and other equipment shall all be symmetrically installed with provisions made for integrating the T-bars and this equipment. Failure to coordinate the work will result in relocation of ceiling components as directed by the Architect/Engineer at the Contractor's expense.
3. The Mechanical Contractor shall obtain copies of all Contractors' and sub-contractors' coordination drawings to insure that all installations are coordinated and no conflicts exist. The Mechanical Contractor shall utilize the structural steel drawings to coordinate installation of material and equipment in the ceiling spaces and in chases. Failure to coordinate the work will result in relocation of components as directed by the Architect/Engineer at the Contractor's expense.

1.21 ALIGNMENT

A. Where several devices, panels, controllers, bells, alarms, thermostats, switches, handles, etc., are to be installed in a common location, this equipment shall be lined up in a horizontal or vertical plane. Request interpretation from the Architect/Engineer for any unusual alignment conditions.

1.22 RECORD DRAWINGS

A. General: Follow the procedures specified in Division 1 "Record Documents".

B. In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
2. Approved substitutions, Contract Modifications, and actual equipment and materials installed. Revise schedules on the drawings.
3. Exterior underground equipment and materials located with triangulated dimensions.

1.23 OPERATION AND MAINTENANCE MANUALS

A. Prepare and provide minimum of three (3) maintenance manuals in accordance with Division 1 "Operation and Maintenance Data".

B. In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Written description of system operation.
2. An equipment list for each piece of equipment furnished. The list shall be in order of equipment label and shall indicate the manufacturer, model number, serial number, and motor horsepower and voltage ratings.
3. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and list of replacement parts.
4. A copy of all final corrected equipment submittals, control diagrams, descriptive brochures, and a list of all parts of each piece of equipment.
5. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
6. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions, and lubrication charts and schedules
7. Copies of all permits required for occupancy.

C. All of the materials shall be indexed, arranged categorically, and be bound in a rigid, plastic covered, three ring binder. Provide tabs for each major section.

D. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, trouble shooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.

1.24 TRAINING AND INSTRUCTIONS

A. General: Follow the procedures specified in Division 1 "Demonstration and Training".

B. At the completion of the work, and before final acceptance of the building by the Owner, each Contractor, together with manufacturers' representatives, shall instruct the Owner's designated representatives in the care, adjustment, maintenance and operation of equipment and systems in accordance with Division 1.

C. A manufacture's representative of each major component or system shall inspect his work, make final adjustments, place them in a satisfactory working condition, and instruct the owner in their operation. Each representative shall also provide a letter to the Architect/Engineer indicating that an inspection has been performed, instruction given, and the equipment is installed and operating in conformance with the manufacturer's written installation instructions.

1.25 GUARANTEES AND WARRANTIES

A. All work performed shall be guaranteed in writing by the Contractor for a period of one (1) year after substantial completion. The Contractor shall remedy any defects due to faulty materials or workmanship, and pay for any damage to other work resulting therefrom which appear within a period of one (1) year from date of occupancy or the date of the Owner's Certificate of Final Payment of the total contract, and in

accordance with the terms of any special guarantees provided in the Contract. The Owner shall give notice of observed defects with reasonable promptness. All questions arising under this article shall be decided by the Owner notwithstanding final payment.

1.26 METHOD OF PROCEDURE

A. The Drawings accompanying these Specifications are diagrammatic and intended to indicate the approximate and relative locations of the materials and systems. Installation, connection, and inter-connection of all components of the systems shall be complete and made in accordance with the manufacturer's instructions and best practices of the respective trades.

B. Install all work and equipment at such time and in such manner as not to delay or interfere with any other Contractor performing work.

C. Coordinate with all Contractors as to the locations of different lines of pipe, ducts, conduit, and electrical equipment before erecting any Work, so as to avoid interference. In case of conflict, equipment shall be relocated, without additional cost, as directed by the Engineer regardless of which equipment was installed first. Each Contractor shall cooperate with other Contractors for the proper securing and anchoring of all Work included within these Specifications.

D. Care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other Contractors. Each Contractor will be held responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.

E. All items of labor, material and equipment not specified in detail or shown on the drawings but incidental to or necessary for the complete and proper installation and proper operation of the several branches of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the specifications or drawings.

1.27 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to Architectural interior and exterior elevations and equipment specifications for rough-in requirements.

1.28 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of systems, materials, and equipment. Comply with the following requirements:

1. Coordinate systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of systems with utilities and services. Comply with requirements of governing regulations, service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect/Engineer.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors where units are concealed behind finished surfaces.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Install materials and equipment firmly supported and secured to the building construction where required, and according to manufacturer's instructions.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 26 0010

SECTION 26 0090 - REMOVALS AND DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes requirements for demolition and removals of electrical systems and portions of the same.

B. The Drawings are drawn to generally indicate the demolition required to accommodate the new construction but are not all-inclusive. The full extent of demolition work must be determined in the field based on the actual conditions encountered and as required for the satisfactory provision and proper execution of the work. It is the responsibility of the Contractor to coordinate the scope of work for each subcontractor.

1.3 DESCRIPTION OF WORK

A. This Contractor shall be responsible for the removal of existing fixtures, wiring, conduit, supports, and equipment in the existing building which is noted or shown on the Drawings or which is in conflict with the new construction or new electrical systems. Remove all associated appurtenances such as hangers, sleeves, supports, and concrete pads. Remove all associated wiring back to its source. Existing equipment removed shall be disconnected at source and capped. Furnish all labor, equipment hauling, rigging, scaffolding, etc. necessary for the removal phase of the project.

B. Where existing wiring, or equipment must be removed to install new systems and these systems must also remain operational because of phasing, the contractor shall provide temporary piping, ductwork, wiring, and equipment for the remainder of the construction phasing. Contractor shall re-install new wiring to existing equipment remaining, after new systems or construction is complete.

C. All Division 26 electrical equipment to be removed must be disconnected by the Electrical Contractor.

1.4 SHUT-DOWNS

A. Existing fixtures, equipment and related accessories which require systems to be shut-down shall be coordinated with the Owner. Periods of shut-down shall be minimal and all new work shall be planned and scheduled to accomplish as few shut-downs as possible.

B. All construction and removal work shall be performed in a manner as to keep the existing systems in operation as the work progresses. Prior to commencing construction, the contractor shall review the construction schedule with the Owner and Architect to assure a well-coordinated schedule.

1.5 CUTTING AND PATCHING

A. Cutting and patching shall be by this Contractor unless otherwise indicated. Patch existing wall, roof, and floor openings after removing electrical equipment, conduit and wiring. Patching shall match existing materials and methods of construction. Patching of floors, walls and roofs shall be performed in a manner to maintain structural integrity and to the satisfaction of the Architect. Patch and repair any spray on fire-proofing required because of removal of conduit, wiring, or equipment.

1.6 OWNERSHIP

A. The Owner shall have the option of keeping any or all salvageable items removed from building such as lighting fixtures, panelboards, etc. Any items removed from the building that Owner does not wish to keep shall become the property of this Contractor and he shall recycle or dispose of these items in a legal landfill. Prior to removing any materials or equipment, the Contractor shall review with the Owner which materials or equipment the owner chooses to retain; the Contractor shall proceed to remove claimed equipment with extreme care so as not to damage the equipment or material.

B. Provide notarized certification that disposal of materials resulting from demolition operations has been accomplished in conformance with all pertinent requirements and regulations of governmental agencies having jurisdiction. All cost for disposal shall be the responsibility of the contractor.

C. All hazardous materials shall be disposed of in a legal manner that complies with EPA and DEP regulations. All cost for disposal shall be the responsibility of the contractor. Provide notarized certification that disposal of all hazardous materials has been accomplished in conformance with all pertinent requirements and regulations of governmental agencies having jurisdiction.

PART 2 - PRODUCTS: (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise noted, Contractor shall be responsible for the demolition and removal of those existing materials and systems which would normally be handled and/or installed by the tradesman under jurisdiction of the Contractor. Furthermore, Contractor shall be responsible for the respective cutting, removal, patching, and repair of existing floors, walls, ceilings, roof construction, and site work.

B. Should the contractor encounter a material, during the progress/demolition on this project they suspect may contain asbestos, and the material must be removed or penetrated to accommodate the new construction, the Contractor shall immediately notify the Owner and Architect in writing before any work on the material is performed. The Owner will have the material tested and have it removed if the test results warrant it.

C. Materials resulting from demolition and removal operations shall become the property of the Contractor and shall be completely removed from the site unless noted otherwise on the drawings or requested by the Owner.

D. Debris and other materials resulting from demolition operations shall not be permitted to be stored on site, unless noted otherwise.

E. When an existing item is removed, the contractor shall also remove the accompanying sealant, supports, and all anchors. All sealant residue shall be completely removed and the walls cleaned and repaired to match adjacent wall surfaces.

F. All extraneous items not required or needed in the renovated areas (i.e., dead thermostats, dead electric outlets, switches, conduits, abandoned wiring, floor outlets, etc.) shall be removed by the respective contractors and the surfaces patched to match the adjacent existing and/or new finishes.

G. Contractor shall protect all floors, walls, ceilings, and furnishings throughout the demolition area. Any damage to the area as a result of demolition shall be fixed to match existing conditions at no extra cost to the Owner.

H. Where equipment or wiring is removed, and holes or marked surfaces are left in the walls or ceiling they shall be patched to match the existing surface. Painting material and methods shall be as specified in the project specifications.

I. It may be necessary for each contractor to temporarily remove, store, and reinstall ceiling tiles as required to access equipment, and conduit in the ceiling space or to install new. Each contractor is responsible for damage to the ceiling tiles. Tiles or grid damaged by this contractor shall be replaced with new by this contractor. The contractor shall document areas of the ceiling removed by his workers

END OF SECTION 26 0090

SECTION 26 0519 - LOW-VOLTAGE POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves for cables.

1.3 SUBMITTALS

A. Submit product data for each type of product, indicating cable and accessory construction, materials and ratings.

B. Submit manufacturer's installation instruction.

C. Submit qualification data for testing agency.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Comply with NFPA 70.

B. Conductor sizes based on copper. Aluminum conductors will not be accepted unless specifically noted.

1.5 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

B. Wire and cable routing, if shown on Drawings, is approximate unless dimensioned. Route wire and cable as required to meet project conditions. Field verify all dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver wires and cables according to NEMA WC26.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Southwire Company.
5. Carol Cable Company.

B. Copper Conductors: Insulated soft-drawn copper conductors with dual-rated type THHN//THWN-2 600v insulation, to comply with NEMA WC 70, unless otherwise noted. Conductors shall be rated for 90 degrees C. wet or dry.

C. Multiconductor Cable: Comply with NEMA WC 70 for Type MC metal-clad cable, 600v insulated copper conductors, with full size insulated copper ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. O-Z/Gedney; EGS Electrical Group LLC.
3. 3M; Electrical Products Division.
4. Tyco Electronics Corp.
5. Amp Incorporated.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: Schedule 40, galvanized steel, ASTM A 53/A 53M Type E, Grade B, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.138-inch thickness and length to suit application.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance

of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that all conduits or raceways are clean and dry prior to installation of conductors or cables. If conduits or raceways are not clean and/or dry, clean and dry conduits or raceways prior to installation of new conductors or cables.

3.2 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.3 CONDUCTOR INSULATION AND CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Feeders or Branch Circuits; Type THHN/THWN-2, single conductors in raceway.

C. Branch Circuits (concealed in hollow partitions or above ceilings): Type THHN/THWN-2, single conductors in raceway, or Type MC metal-clad cable for 6 foot long (maximum) connection from outlet box to light fixtures or run between wiring device boxes.

D. Branch Circuits in Cable Tray: Type MC metal-clad cable, or Type MI mineral-insulated / metal-sheathed cable.

E. Cord Drops and Portable Appliance Connections: Type SO hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

F. Class 1 Control Circuits: Type THHN/THWN-2 in raceway.

G. Class 2 Control Circuits: Type THHN/THWN-2 in raceway, or power-limited cable where concealed in building finishes.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Install conductors in conduit in areas of open structure. Exposed cables shall not be used in areas of open structure unless otherwise indicated. Conceal cables in finished walls or above ceilings.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Install conductors in continuous runs. If conditions do not allow for continuous runs proper splices shall be made in accordance with this Section. Splices for all Feeder conductors must be approved by Engineer prior to installation.

D. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

E. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems". Identify each conductor with its circuit number or other designation indicated on drawings, at each end and in all pull boxes.

F. Neatly train and lace conductors inside boxes, equipment and panel boards.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. Make terminations so there is no bare conductor at the terminal.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than non-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits.

3.6 SLEEVE INSTALLATION FOR CABLE PENETRATIONS

A. Concrete Slabs and Masonry Walls: Install sleeves for cable penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

1. Cut sleeves to length for mounting flush with both wall surfaces. Extend sleeves installed in floors 2 inches above finished floor level.
2. Seal space outside of sleeves with grout for penetrations of concrete and masonry or with approved joint compound for gypsum board assemblies.

B. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall. Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

C. Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Sections.

D. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work. All products shall be compatible with roofing system and acceptable to roofing installer.

E. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and weathertight sealant. Size sleeves to allow for 1/4-inch annular clear space between cable and sleeve for installing sealant.

3.7 FIELD QUALITY CONTROL

A. Perform conductor tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test the following conductors for compliance with requirements:

a. Service entrance conductors
b. Feeder conductors serving distribution equipment (panelboards, switchboards, motor control centers, etc.).
c. Conductors feeding critical equipment (generators, UPS systems, etc.).

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace malfunctioning conductors or cables and retest as specified above.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

1. This Section includes methods and materials for grounding electrical systems and equipment**.**

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Ground rods.
2. Ground rings.
3. Grounding arrangements and connections for separately derived systems.
4. Grounding for sensitive electronic equipment.

C. Qualification Data: For testing agency and field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data:

1. Instructions for periodic testing and inspection of grounding features at ground rings or grounding connections for separately derived systems NETA MTS.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section by 10 inch length (minimum) or as indicated on drawings, with insulators and standoff brackets. Chatsworth Products No. 13622-010.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, solid or sectional type; 5/8 inch diameter by 96 inches in length unless otherwise indicated on the drawings.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No.8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum unless indicated otherwise.

1. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to

normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install where indicated in electrical and telephone equipment rooms, in electrical rooms containing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch minimum from wall, 6 inches above finished floor.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Metal-clad cable runs.
2. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
3. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding

conductor in raceway or cable tray from grounding electrode system to each service location, terminal cabinet, equipment rack, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus unless otherwise indicted.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F. Site Lighting; Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations or use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Grounding for Steel Building Structure: Install a driven ground rod at column(s) indicated.

F. Ground Ring: When indicated, install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building. Bury ground ring not less than 24 inches from building foundation.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.

G. Concrete-Encased Grounding Electrode: Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified below, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

B. Report measured ground resistances that exceed the following values:

1. Power System with Capacity 500 kVA and Less: 10 ohms.
2. Power System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect/Engineer promptly and include recommendations to reduce ground resistance.

3.5 GRADING AND PLANTING

A. Restore surface features, including vegetation, grass, or paving, at areas disturbed by Work of this Section. Reestablish original grades unless otherwise indicated. Restore areas disturbed by trenching, and other activities to their original condition.

END OF SECTION 26 0526

SECTION 26 0530 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.
3. Each type product.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.4 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.5 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70. Provide electrical components which are UL listed and labeled.

B. Comply with NECA “Standard of Installation” pertaining to anchors, fasteners, hangers, supports and mounting equipment.

1.7 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. Refer to Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. GS Metals Corp.
   d. Thomas & Betts Corporation.
   e. Unistrut; Tyco International, Ltd.
   f. Ideal Industries Inc
   g. Hilti
   h. Panduit.
2. Metallic Coatings: Hot-dip galvanized after fabrication.
3. Painted Coatings: Manufacturer's standard painted coating.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. Verify

suitability of fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   1) Hilti Inc.
   2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
   3) MKT Fastening, LLC.
   4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
   5) Panduit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland Cement Concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) MKT Fastening, LLC.
      5) Panduit.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps, single-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 0530

SECTION 26 0533 – RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 SUBMITTALS

A. Product Data: For conduits and fittings, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, cabinets, and other products.

1.4 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. AFC Cable Systems, Inc.

2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. O-Z Gedney; a unit of General Signal.
8. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Intermediate Metal Conduit: ANSI C80.6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit. Comply with NEMA RN 1, 0.040 inch minimum coating thickness

E. Electrical Metallic Tubing: ANSI C80.3.

F. Flexible Metal Conduit: Zinc-coated steel.

G. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel or die-cast, set-screw or compression type.

I. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. ElecSYS, Inc.
6. Electri-Flex Co.
7. Carlon Electrical Products.
8. Manhattan/CDT/Cole-Flex.
9. RACO; a Hubbell Company.
10. Thomas & Betts Corporation.

B. Electrical Nonmetallic Tubing (ENT): NEMA TC 13.

C. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. Liquidtight Flexible Nonmetallic Conduit (LFNC): UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum, riser, or general-use as required by the installation.

2.4 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Panduit.
5. Wiremold.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12, or 3R as required by the installation. Manufacturer's standard enamel finish.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type, Screw-cover type or flanged-and-gasketed type as indicated or required for application.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Size and capacity as indicated. Manufacturer's standard enamel finish in color selected by Architect/Engineer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Thomas & Betts Corporation.
    b. Wiremold / Legrand.
    c. Panduit.
    d. MonoSystems.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect/Engineer from manufacturer's standard custom colors.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
    a. Hubbell Incorporated; Wiring Device-Kellems Division.
    b. Panduit Corp.
    c. Walker Systems, Inc.
    d. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Hoffman.
3. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
4. O-Z/Gedney; a unit of General Signal.
5. RACO; a Hubbell Company.
6. Scott Fetzer Co.; Adalet Division.
7. Spring City Electrical Manufacturing Company.
8. Thomas & Betts Corporation.
9. Carlon Electrical Products.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, aluminum, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Non-adjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum or galvanized**,** with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Metal barriers to separate wiring of different systems and voltage.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray or Green.
2. Configuration: Units shall be designed for flush burial and have open or integral closed bottom, as indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC." or "TELEPHONE." as indicated for each service.
6. Conduit Entrance Provisions: For integral closed-bottom units, provide conduit-terminating fittings to mate with entering ducts for secure, fixed installation in enclosure wall.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. CDR Systems Corporation.
   d. NewBasis.

C. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. Christy Concrete Products.
   d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

2.8 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.9 MECHANICAL SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic, Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit, or Rigid non-metallic conduit Type EPC-80-PVC where indicated.
2. Concealed Conduit, Aboveground: Rigid steel conduit, or Intermediate metal conduit
3. Underground Conduit: RNC, Type EPC-40 or 80-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Motor-Driven Equipment); Liquidtight flexible metal conduit.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.
6. Application of Handholes and Boxes for Underground Wiring:
   a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.

b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC. Includes raceways in the following locations:
   a. Loading docks.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms where installed from floor level up to 8 feet above floor.
3. Embedded in concrete slab or within slab-on-grade fill: Rigid nonmetallic conduit.
4. Concealed above Ceilings and in Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable
   a. Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway or EMT.
   b. Vertical Shafts: Riser-type, optical fiber/communications cable raceway or EMT.
   c. Concealed General Purpose Distribution: General-use, optical fiber/communications cable raceway, Riser-type, optical fiber/communications cable raceway, Plenum-type, optical fiber/communications cable raceway, or EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.2 RACEWAY INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation. Use temporary closures to prevent foreign matter from entering raceway.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab. Protect stub-ups from damage where conduits rise through floor slabs.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run RNC conduit parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Stub-up connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver operated, threaded flush plugs flush with floor for future equipment connections.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Attics: 125 deg F temperature change.
2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set floor boxes level and flush with finished floor surface. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with

expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

4. Install rigid steel conduit for all bends 45-degree and greater.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally in trench a minimum of 36 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. In other areas, set covers of enclosures 1 inch above finished grade and taper same material as adjacent area to top of cover.

D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Coordinate locations with contractor installing slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 2 inches above finished floor level.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work. All products shall be compatible with roofing system and acceptable to roofing installer.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and sealant. Select sleeve size to allow for 1/4-inch annular clear space between conduit and sleeve for installing watertight sealant.

L. Underground, Exterior-Wall Penetrations: Install cast-iron or galvanized sleeves. Size sleeves to allow for required annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping".

3.8 APPLICATIONS FOR BOXES, CABINETS AND ENCLOSURES

A. Cabinets: Flush mounted, NEMA enclosure type 1 except otherwise indicated.

B. Hinged Door Enclosures: NEMA type 12 enclosure except as indicated.

C. Hinged Door Enclosures Outdoors: Install drip hood, factory tailored to individual units.

D. Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each location and in conformance with the following requirements.

1. Interior Dry Locations: Sheet steel, NEMA type 1.
2. Locations Exposed to Weather or Dampness: Cast metal, NEMA type 3.
3. Locations Exposed to Weather or Dampness: Molded PVC or glass fiber reinforced plastic, NEMA type 3R.
4. Wet locations: NEMA type 4 enclosures.

E. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types suitable for each location except as otherwise indicated.

F. Floor boxes: In slabs on grade and wet locations use NEMA type 4 boxes. At other locations in slabs, use concrete-tight NEMA 1 boxes. Contractor shall verify floor construction and verify adequate thickness to accommodate floor box.

G. Carpet/Tile Flange: Coordinate style flange with General Contractor and/or Architect.

3.9 INSTALLATION OF OUTLET BOXES

A. Outlet Boxes at Windows and Doors: Locate close to window trim. For outlets indicated above doors, use 12” mounting height above finished above the door opening except as otherwise indicated.

B. Column and Pilaster Locations: Locate outlet boxes for switches and receptacles on columns or pilasters so the centers of the columns are clear for future installation of partitions.

C. Locations in Special Finish Materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install such boxes without plaster rings. Saw cut all recesses for outlet boxes in exposed masonry walls.

D. Gasketed boxes: At the following locations use cast metal, threaded hub boxes with gasketed weatherproof covers.

1. Exterior locations.
2. Where surface mounted on unfinished walls, columns or pilasters (Cover gaskets may be omitted in dry locations).
3. Where exposed to moisture laden atmosphere.
4. At food preparation equipment within four feet of steam connections.
5. Where indicated.

E. Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.

F. Mounting: Mount outlet boxes for switches with the long access vertical or as indicated. Mount boxes for receptacles either vertically or horizontally but consistently

either way. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the side opposite the hinges and close to door trim, even though electrical floor plans may show them on hinge side.

G. Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4 inches square by 1 ½ inches deep minimum.

H. Cover Plates for Surface Boxes: Use plates sized to box front without overlap.

I. Protect outlet boxes to prevent entrance of plaster, and debris. Thoroughly clean foreign material from boxes before conductors are installed.

J. Concrete Boxes: Saw cut opening for box in center of masonry block cell. Coordinate with masonry installer. Use extra deep boxes to permit side conduit entrance without interfering with reinforcing, but do not use such boxes with over 6-inch depth.

K. Floor Boxes: Install in concrete floor slabs so they are completely enveloped in concrete except for the top. Where normal slab thickness will not envelop box as specified above, provide increased thickness of the slab below box; coordinate with floor slab installer. Provide each compartment of each floor box with grounding terminal consisting of a washer-in-head machine screw, not smaller than no. 10-32, screwed into a tapped hole in the box. Adjust covers of floor boxes flush with finished floor.

3.10 INSTALLATION OF PULL AND JUNCTION BOXES, CABINETS AND ENCLOSURES

A. Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8 inches square by 4 inches deep. Do not exceed 6 entering and 6 leaving raceways in a single box. Quantities of conductors (including equipment grounding conductors) in pull or junction box shall not exceed the following:

Size of Largest Conductors in Box	Maximum no. of Conductors in Box
No. 4/0 AWG	30
250MCM	20
500MCM	15
Over 500 MCM	10

1. Cable supports: Install clamps, grids or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 inches inside boxes.

B. For pull boxes in inaccessible ceilings, mount with the covers flush with the finished ceiling.

C. In finished spaces, set flush with walls.

D. Size: Provide pull and junction boxes for telephone, signal and other systems at least 50% larger than would be required by Article 370 of NEC, or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

E. Mount with fronts straight and plumb.

F. Install with tops 78 inches above floor.

3.11 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finish, including chips scratches, and abrasions.

3.12 GROUNDING

A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box or enclosure.

3.13 IDENTIFICATION

A. Every concealed cabinet, pull box, junction box or enclosure shall have identification label on exterior cover indicating equipment, feeder circuit or other device installed within or connected through enclosure.

B. Every box exposed to view in finished spaces shall have same information listed on inside of box cover.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Wiring device labels
5. Warning labels.
6. Equipment identification labels.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: A list of nomenclature for electrical equipment and system components identification signs and labels.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes and standards. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Install identifying devices before installing acoustical ceilings and similar concealment. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright red colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Formulated to resist degradation in direct-burial service.
3. Embedded continuous solid metallic foil strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WIRING DEVICE LABELS

A. Machine-printed adhesive-backed tape using a clear background and lettering to contrast with the surface applied to, or else white tape with black lettering. Letters shall be 1/4 inch high.

2.5 WARNING LABELS

A. Labels shall comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed polyester or vinyl, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Warning labels include, but are not limited to, the following:

1. Arc Flash Warning: Adhesive-applied printed polyester or vinyl label, white background with colored imprint, 2” x 4” minimum size, to read: “WARNING – ARC FLASH & SHOCK HAZARD – APPROPRIATE PERSONAL PROTECTION EQUIPMENT REQUIRED.”
2. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
3. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES "

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Self-adhesive, engraved, laminated acrylic or melamine label: Adhesive backed, with engraved 3/8 inch high letters on a background field:

1. White letters on black background; normal/utility power source.
2. White letters on red background; emergency power source.
3. Black letters on orange background; UPS power source.

B. Stenciled Legend: Use non-fading, waterproof, black paint. If surface receiving the label is dark, use white paint. Minimum letter height shall be 1 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Type 6/6 nylon cable ties, self-extinguishing, 1-piece, self-locking,

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Power-Circuit Conductor Identification: For conductors in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape and wraparound marker labels. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

B. Branch-Circuit Conductor Identification: Identify conductors for branch circuits in junction, pull boxes and panelboard gutters. Identify each ungrounded conductor according to source and circuit number using wraparound marker labels.

C. Conductors to Be Extended in the Future: Attach marker labels-on tags to conductors and list source and circuit number.

D. Auxiliary/Low Voltage Electrical Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data conductors and connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Warning Labels for Electrical Equipment: Apply self-adhesive warning labels to comply with NFPA 70 and 29 CFR 1910.145. Apply labels to exterior of door, cover, or access panel in mechanical rooms, electrical rooms, or other similar unfinished spaces. Apply to inside of cover or door for panelboards or equipment located in finished spaces.

1. Arc Flash Warning: provide labels on equipment including, but not limited to, the following:
   a. Switchboards, panelboards, transfer switches, meter socket enclosures, and other electrical equipment.
   b. Motor starter enclosures, motor control cabinets, motor control centers, variable frequency drives, equipment control panels or cabinets (whether specified in Division 26 or in other Divisions).
2. Equipment with Multiple Power or Control Sources: including, but not limited to, the following:
   a. Automatic or manual transfer switches.
   b. Controls with external control power connections.
3. Equipment Requiring Workspace Clearance, including panelboards, switchboards, etc.
   a. Apply to front of door or cover of equipment in mechanical rooms, electrical rooms, or other unfinished spaces.
   b. Apply to inside of door or cover of flush panelboards and similar equipment in finished spaces.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with drawings and schedules. Equipment include power, lighting, control, communication, signal, and alarm systems specified in Division 26, 27, and 28, as well as equipment provided under other Divisions.

1. Labeling Instructions:
   a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Provide a single line of text with 3/8-inch- high letters on 1-1/2-inch-high label; where 2 lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Stenciled legend 1 inches high.
2. Examples of equipment to be labeled:
   a. Switchgear, switchboards, unit substations.
   b. Panelboards and load centers.
   c. Multi-meter assemblies.
   d. Motor-control centers, motor starters, lighting contactors
   e. Disconnect switches, enclosed circuit breakers (if remote from equipment served).
   f. Push-button control stations (if separate from equipment controlled).
   g. Generators (if more than one).
   h. Uninterruptible power supply equipment (if more than one).
   i. Duct Detector remote test switches
   j. Outlet jacks, racks, and patch panels for voice and data communication and for signal and control functions.

H. Wiring Device Identification Labels: On every wiring device cover plate, install a machine printed adhesive tape label that identifies the power source (panelboard tag and circuit number). This includes receptacles, wall switches and lighting control stations (both line voltage and low voltage).

I. Communication Outlet Identification Labels: On every data and/or voice outlet cover plate, install a machine printed adhesive tape label that identifies the individual jack location and destination (patch panel).

3.2 INSTALLATION

A. Apply identification devices to surfaces that require finish, after completing finish work.

B. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

C. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Locate bands at changes in direction, at penetrations of walls and floors, at 30-foot maximum intervals in straight runs, and at 15-foot maximum intervals in congested areas.

D. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors, except match an existing color code when in an existing facility having a different color coding.

1. Color shall be factory applied, or field applied for sizes larger than No. 10 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.
3. Colors for 480/277-V Circuits:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral: Gray.
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

END OF SECTION 26 0553

SECTION 26 0945 - LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes a Digital Lighting Control and Management System for sensor-based control of interior fixtures, and time-based and sensor-based control of exterior lighting fixtures.

B. The system shall be capable of turning interconnected lighting loads on/off, as well as dimming lights where dimming capability is specified. All system devices shall be individually addressable, with designated devices networked together.

1.3 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)

B. National Electrical Manufacturers Association (NEMA)

C. Underwriters Laboratories, Inc.: UL508 – Industrial Control Equipment

1.4 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:

1. Room Power Packs: provide with 0-10v dimming where indicated.
2. Occupancy/Vacancy Sensors: Auto adjusting, MicroSet technology, NEMA WD7 compliant occupancy/vacancy sensors.
3. Wallstations: Smart control device that is pre-configured, with pre-engraved digital pushbuttons, either manual (toggle) style, or toggle style with dimming adjustment.
4. Control Communication Cable: Pre-defined lengths of quick connect plenum rated cable (RJ45) for power and data to smart devices. Cable color shall be green to coordinate with other communications systems (see Section 27 1506).
5. Relay control panel for exterior lighting control.
6. Outdoor photocell for daylight sensing, and photocell interface for exterior lighting control.
7. Indoor photocell for daylight sensing and dimming control of interior lighting.

1.5 LIGHTING CONTROL FUNCTIONS

A. General: Provide the following lighting control capabilities:

1. Occupancy/Vacancy requirements – Provide occupancy sensors with Automatic On/ Automatic Off functionality and vacancy sensors with Manual On/Automatic Off functionality as shown.

B. Space Control Descriptions. Refer to drawings for locations where specific control method and quantity of control devices are required:

1. Spaces with dimming controls:
   a. Ceiling mounted occupancy/vacancy sensor(s) – automatically turns off all room lights after room is unoccupied, per adjustable time delay.
   b. Low voltage wall station with raise/lower 0-10v dimming allows user to manually turn lights on/off and adjust light level, interconnected with occupancy/vacancy sensor.
2. Spaces without dimming controls:
   a. Ceiling occupancy/vacancy sensor(s) automatically turns off all room lights after room is unoccupied, per adjustable time delay. Low voltage wall station allows user to manually control lights on/off.
   b. Wall mounted occupancy/vacancy sensor(s) with manual override; automatically turns off all room lights after room is unoccupied, per adjustable time delay. Override button (on wall mounted sensors only) allows user to manually control lights on/off.

1.6 PERFORMANCE REQUIREMENTS

A. The Lighting Control System shall include: the power pack, wallstations, matching color screwless wallplates, occupancy/vacancy sensors, daylight sensors, quick connect cable (plenum rated).

1.7 SUBMITTALS

A. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit, as proposed, to be installed (standard diagrams will not be accepted).
2. Scale floor plan drawing for each space showing exact location of each sensor, room controller and digital switch. AutoCAD (.dwg) files will be furnished by the Architect/Engineer for the system vendor's use in preparing shop drawings.

B. Product Data: Catalog sheets, specifications and installation instructions.

C. Warranties: Standard and special warranty information.

1.8 QUALITY ASSURANCE

A. Products: All electrical components and devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended use.

B. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 32° to 104° F
2. Relative humidity: Maximum 90 percent, non-condensing

1.10 WARRANTY

A. Manufacturer shall supply a 5-year warranty on all materials, hardware and software. These warranties will be in effect from date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The design drawings and specifications are based on Hubbell Control Solutions “NX-series” products. Another acceptable system is “nLight Network Control System” products as manufactured by Sensor Switch, an Acuity Brands Company.

B. Refer to lighting control details on the drawings for required products and part numbers.

2.2 WALL OR CEILING MOUNTED OCCUPANCY/VACANCY PERFORMANCE REQUIREMENTS

A. Sensing mechanism:

1. Dual technology:
   a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Incorporate Passive Dual Technology (PDT) to sense motion and sounds.

B. Power failure memory:

1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Sensor shall have time delays from 10 to 30 min.

D. When specified, sensors shall automatically adjust time delay and sensitivity settings.

E. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

F. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

2.3 CEILING MOUNTED SENSORS

A. Provide all necessary mounting hardware and instructions.

B. Sensors shall be Class 2 devices.

C. Connect to other components via quick-connect cable to eliminate wiring errors.

1. Occupancy Sensor and Daylight sensor shall be connected using a daisy chain connection to the Room Controller.

D. Device calibration and features:

1. Sensitivity – 0-100% in 10% increments.
2. Time delay – 1-30, self-adjusts to 10 min based on room occupancy.
3. Test mode – Fifteen second time delay.
4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
5. Walk-through mode.
6. Ultrasonic and Dual Technology Sensors utilize two independent sensor detection circuits simultaneously to ensure optimum performance, regardless of location or proximity to walls and structures.
7. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency, continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
8. All load parameters including Automatic On/Manual On, blink warning and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.

E. Device Status LEDs including:

1. PIR Detection
2. Ultrasonic detection

F. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.

G. Manual override of controlled loads.

H. Multiple occupancy sensors may be installed in a room by simply daisy-chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required

2.4 WALL/CORNER MOUNTED SENSORS

A. Provide all necessary mounting hardware and instructions.

B. Sensors shall be Class 2 devices.

C. Connect to another component via quick-connect cable to eliminate wiring errors.

1. OCC-RJ45 Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize quick-connect cable connections.
2. Two RJ45 connection ports for connection to Room Controller.

3. Occupancy Sensor and Daylight sensor shall be connected using a daisy-chain connection to the Room Controller.

D. Device calibration and features:

1. Sensitivity – 0-100% in 10% increments.
2. Time delay – 1-30, self-adjusts to 10 min. based on room occupancy.
3. Test Mode – Fifteen second time delay.
4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
5. Walk-Through Mode.
6. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
7. All load parameters including Automatic On/Manual ON, blink warning, and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.

E. Device Status LEDs including:

1. PIR Detection
2. Ultrasonic detection

F. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.

G. Manual override of controlled loads.

H. Multiple occupancy sensors may be installed in a room using a daisy chain quick-connect cable to the Room Controller. No additional configuration will be required

2.5 WALLSTATIONS

A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:

1. Removable buttons for field replacement with engraved buttons. Button replacement may be completed without removing the switch from the wall.
2. Intuitive button labeling to match application and load controls.
3. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations which are automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out of the box functionality.

B. Two RJ-45 ports for connection to other system components.

C. Multiple digital wallstations may be installed in a room by connecting them to the local lighting system control network. No additional configuration will be required to achieve multi-way switching.

D. Digital wallstations are delivered with pre-defined functions including, raise, lower, A/V Mode, Quiet Time, manual and scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.

2.6 DAYLIGHT PHOTOSENSORS/ IR RECEIVER

A. Daylight photosensors work with Room Controllers to provide automatic daylight switching capabilities for any load type connected to a room controller. Open loop daylight sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Daylight sensors shall be interchangeable without the need for rewiring. Daylight sensors shall be capable of daisy-chaining with occupancy sensors in each room.

B. Digital daylight sensors include the following features:

1. An internal photodiode that measures only within the visible spectrum and has a response curve that closely matches the photopic curve.
2. The daylight sensor has three light level ranges: Low (3-300 lux), High (30-3000 lux), and Direct Sun (300-30000 lux).
3. Optional digital wallstations to allow occupants to reduce lighting level to increase energy savings and lower lighting levels for a selected period of time or cycle of occupancy.
4. Infrared (IR) transceiver for daylight sensor range and daylight zone gain adjustments via handheld remote programmer.
5. Infrared (IR) receiver for personal control and scene programming via handheld remote programmer.
6. Red configuration LED that blinks to indicate data transmission.
7. Green Mode status LED that blinks to indicate Daylight Commissioning Mode.
8. Green Mode status LED that remains constant ON when daylight range is set to low for available natural light.
9. RJ45 ports for connection to lighting control network.
10. An adjustable head and an optional mounting bracket to accommodate multiple mounting methods and building materials. The daylight sensor may be mounted on a ceiling tile, skylight well, suspended lighting fixture or backbox.

C. Open loop digital daylight sensor includes the following additional features:

1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.

2.7 LIGHTING CONTROL NETWORK AND CABLING

A. The lighting control network is a physical connection and communication protocol designed to optimally control a space within a building. Control devices connect to the lighting control network using Category 5e or 6 green jacketed cables with RJ45 QuickConnect cables which provide both data and power to room devices. Features of the network include:

1. Click & Go default functionality of occupancy sensors, wallstations, slider station, daylight sensors, receptacle controls, BMS status output and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

2.8 SYSTEM POWER PACKS

A. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All devices shall have two RJ45 ports

1. Power Packs shall accept 120 or 277 VAC, be plenum rated, and provide Class 2 power to the system.
2. Power Pack parameters shall be available and configurable remotely from the software and locally via the device push-button.
3. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads.

B. Secondary Packs shall incorporate the relay(s), shall have a second relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system power.

1. Secondary Packs shall be available that provide up to 16 Amp switching of all lighting load types.
2. Secondary Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers
3. Secondary Packs shall be available that provide up to 5 Amps of switching as well as 0-10 VDC dimming of fluorescent ballasts/LED drivers.
4. Secondary Packs are UL924 listed for switching of Emergency Power circuits.

C. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.

PART 3 – EXECUTION

3.1 INSTALLATION

A. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.

B. All low voltage smart devices shall connect using quick-connect cable provided by the system manufacturer. When using wire for connections other than manufacturer-furnished quick-connect low voltage wire (pre-defined lengths of RJ45 cable), provide

detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify termination requirements.

C. Install the wiring specified in this Section in accordance with manufacturer's printed instructions, with Section 27 1506, and other Division 26 sections.

D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities and daylighting setpoints.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.).
3. Load parameters (e.g. blink warning, etc.).

3.2 STARTUP, COMMISSIONING AND TRAINING

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. Provide written notice of the system startup and adjustment date to the Architect/Engineer and to schedule initial training session with Owner.

C. Upon completion of the system commissioning the factory-authorized technician shall provide training to the owner's personnel on the adjustment and maintenance of the system. Include (two) two-hour sessions, one at completion of project and one approximately one month after occupancy for followup adjustments and re-training.

END OF SECTION 26 0945

SECTION 26 2100 – ELECTRICAL DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Load centers.
3. Surge protection devices
4. Elevator Control Switches
5. Customer Power Monitor / Meter

1.3 SUBMITTALS

A. Product Data: For each specified product, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.

C. Field Quality-Control Test Reports.

D. Operation and Maintenance Data

1.4 DEFINITIONS

A. TVSS: Transient voltage surge suppressor.

B. SPD: Surge Protection Device

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain all similar components and accessories from single manufacturer where available.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between equipment and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and shipping materials from inside equipment. Handle and prepare equipment for installation according to manufacturer's instructions.

B. Store in clean, dry environment. Maintain in factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and ambient temperature and humidity conditions are at occupancy levels for the remainder of the construction period:

1.8 COORDINATION

A. Coordinate layout and installation of equipment and other components with other construction, including electrical and other types of equipment, raceways, piping, obstructions to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels to allow complete swing and/or removal.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Subject to the compliance with these specifications, the following manufacturers may offer specified or equivalent products:

1. Panelboards and Accessories:
   a. Square D Company (Basis of Design).
   b. Eaton Corp.; Cutler-Hammer Products.
   c. General Electric Co.; Electrical Distribution & Control Div.
   d. Siemens Energy & Automation, Inc.

B. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Conductor Connectors: Compression type suitable for use with copper or aluminum conductor material and sizes.

1. Material: Tin-plated aluminum.

2. Main and Neutral Lugs: Top or bottom as Installer's option.
3. Ground Lugs: Compression type, suitable for use with copper or aluminum conductor material.

D. Service Equipment Label: NRTL labeled for use where indicated as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, power and feeder distribution type, type and ratings as scheduled.

B. Enclosures:

1. Refer to schedules for cabinet mounting style. Cabinets shall be rated for environmental conditions as scheduled or required by location.
   a. Indoor Dry and Clean Locations: Type 1
   b. Outdoor Locations: Type 3R
2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:
   a. Panels and Trim: Steel factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel for recessed mounting and surface mounting in unfinished spaces. Same painted finish as panel front and trim for surface mounting in finished spaces or for Type 3R cabinets.
4. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
5. Provide four (4) extra keys for each style lock.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit Breaker or Main Lugs only. Refer to panel schedule on drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents. Provide type and trip ratings as scheduled.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.
4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: with mechanical connectors for copper feeders and branch-circuit ground conductors, or compression connectors for aluminum feeders; style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type HACR-rated for use on refrigeration equipment circuits, Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 120 or 24 volt trip coil energized from separate circuit, voltage as indicated.
    f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in ‘on’ or ‘off’ position.
    h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.4 DISCONNECT SWITCHES

A. General: Provide circuit and motor disconnect switches in types, sizes duties, features ratings, and enclosures as required or indicated. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.

1. Provide NEMA 1 enclosure except for outdoor switches, and other indicated locations.
2. Provide NEMA 4 enclosures with rain tight hubs.
   Fusible Switches: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

3. Fuses: Provide type and rating indicated, with fuses of classes and current ratings indicated. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuse.

B. Non-fusible Disconnects: heavy duty switches of classes and current ratings as required or indicated.

C. Double-Throw Switches: heavy duty switches of classes and current ratings as required or indicated.

D. Bolted Pressure Switches: bolted pressure switches conforming to and listed under UL Standard 977; single or double-throw arrangement as required or indicated. For fusible units provide fuses as indicated.

E. Service Switches: heavy duty fusible switches. UL listed for use as service equipment under UL Standard 98 or 869.

F. Electrical Interlocks: Provide number and arrangement of interlock contacts in switches when indicated.

2.5 ELEVATOR CONTROL SWITCHES

A. General: Provide elevator "control" disconnect switches with shunt trip, fire alarm interface and monitoring, fuses, and other features specified and indicated on the drawing. Provide switches in sizes, ratings, and enclosures as required or indicated. Provide units with horsepower ratings suitable to the loads.

2.6 SURGE PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Square D Company (Basis of Design) – "Surgelogic" EMA SPD
2. General Electric Company;
3. Siemens Energy & Automation, Inc.
4. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
5. Advanced Protection Technologies.
6. Leviton.

B. Surge Protection Device (SPD) Description: IEEE C62.41-compliant, externally mounted, solid-state, parallel-connected, modular type (with field-replaceable modules), with sine-wave tracking suppression, UL 1283 EMI/RFI filtering modules, listed to UL 1449 third edition, and with the following features and accessories:

1. UL Listed Short Circuit Current Ratings (SCCR): 200-kA.
2. Peak Single-Impulse Surge Current Rating: 160 kA per phase.
3. Replaceable modules in a NEMA 3R cabinet.
4. Surge current paths for ten modes of protection.
5. Field wired connections to phase buses (circuit breaker), neutral bus, and ground bus.

6. LED indicator lights for protection status on each phase.
7. Audible alarm, with silencing switch, to indicate when protection has failed.
8. Transient-event counter set to totalize transient surges, audible alarm with switch.
9. Ten year product warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation

B. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PANELBOARDS

A. Install panelboards and accessories according to manufacturer's instructions and NEMA PB 1.1.

B. Mounting: Install panelboards using anchorage devices appropriate for the substrate. Mount top of trim a maximum of 90 inches above finished floor, unless otherwise indicated. The operating handle of top-most switch or circuit breaker, in 'on' position, shall not exceed 79 inches above finished floor or grade.

1. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

C. Install overcurrent protective devices not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Install filler plates in unused spaces.

D. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 SURGE PROTECTION DEVICES

A. Install unit(s) per manufacturer's instructions. Install unit per manufacturer's instructions. Verify all phase, neutral and ground connections are correct.

Mount at location indicated. Anchor to surface indicated using appropriate fasteners.

B. Connect with conductors as indicated. Keep conductor lengths as short as possible.

3.4 ELEVATOR CONTROL SWITCHES

A. Mount switches in locations coordinated and approved by the elevator installer and/or AHJ.

B. Coordinate fire alarm and elevator power connections with respective installers.

3.5 IDENTIFICATION

A. Identify field-installed conductors and components. Provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a circuit directory to indicate installed circuit loads after balancing loads; incorporate Owner's final room designations.

1. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Nameplates: Label each equipment cover with an engraved laminate nameplate with 3/8 inch lettering, white letters on a black background (normal power) or red background (emergency power). Use panel designation referenced on the drawings.

D. Circuit Breaker Nameplates: Label each branch circuit breaker in distribution panelboards with an engraved laminate nameplate, 1/4 inch high white letters.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification for each piece of equipment.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies equipment was tested and that describes deficiencies detected, remedial action taken and observations after remedial action.

3.7 ADJUSTING

A. Adjust moving parts and operable component to function smoothly.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows.

1. Measure as directed during period of normal system loading. Perform phase load-balancing circuit changes outside normal occupancy/working schedule of the facility.

2. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
3. Tolerance: Difference exceeding 10 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.8 PROTECTION

A. Protect installed equipment from damage, paint, moisture, dirt and dust during remainder of construction period.

3.9 CLEANING

A. On completion of installation, inspect interior and exterior of equipment. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 2100

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles.
2. Switches and wall-box dimmers.
3. Device cover plates.
4. Occupancy/vacancy sensors.
5. Communications outlets.
6. Pendant cord-connector devices and cord and plug sets.
7. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.4 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain

all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 WIRING DEVICES - GENERAL:

A. Refer to electrical drawings for types and locations of wiring devices required.

B. Modular wiring devices are permitted for use. Pre-wired pigtail connectors with crimped and welded brass contacts shall be terminated to UL Fed Spec approved devices. Provide circuit tester that analyzes circuit via pigtail connector and via installed device, test prior to installing electrical trim. Pass & Seymour “PlugTail” or equal.

2.2 STRAIGHT BLADE RECEPTACLES

A. Duplex Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Basis-of-Design: Pass & Seymour 5362.
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

B. Tamper Resistant Duplex Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Basis-of-Design: Pass & Seymour; TR5352 (duplex).
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through-type. Comply with NEMA WD 1, NEMA WD 6, UL 498, Federal Specification WC596, and UL943, Class A. Include indicator light that is lighted when device is tripped. Must have self-test feature (conducts an automatic test every three seconds, ensuring ground fault protection). If ground fault protection is compromised, power to the receptacle must be discontinued.

B. Duplex GFCI Receptacles, NEMA 5-20R, 125 V, 20 A:

1. Basis-of-Design: Pass & Seymour; 2097.
2. Other manufacturers who may offer equal products include the following:
    a. Cooper
    b. Hubbell
    c. Leviton

C. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:

1. Basis-of-Design: Pass & Seymour; 2097TR.
2. Other manufacturers who may offer equal products include the following:
    a. Cooper
    b. Hubbell
    c. Leviton

D. Tamper-Resistant Hospital-Grade, Duplex GFCI Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD.

1. Basis-of-Design: Pass & Seymour; 2097HGTR.
2. Other manufacturers who may offer equal products include the following:
    a. Cooper
    b. Hubbell
    c. Leviton

2.4 USB CHARGING RECEPTACLES

A. USB charging receptacle with (4) 5-volt DC USB ports and minimum charging output of 4.2 A. 120VAC line voltage. Comply with requirements of UL1310.

1. Basis-of-Design; Pass & Seymour TM8USB4*CC6.
2. Other manufacturers who may offer equal products include the following:
    a. Cooper
    b. Hubbell
    c. Leviton

B. Combination 20A 120v duplex receptacle (tamper-resistant) with one 5-volt DC USB-A and one 5-volt USB-C charging ports and minimum charging output of 3.1 amp. 120VAC line voltage. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification WC-596.

1. Basis-of-Design; Pass & Seymour PTTR20ACUSB.
2. Other manufacturers who may offer equal products include the following:
    a. Cooper
    b. Hubbell
    c. Leviton

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 1449, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 volts and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Receptacles: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R

1. Basis-of-Design: Pass & Seymour; 5362BLSP.
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

1. Basis-of-Design: Pass & Seymour; L520-R.
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

2.7 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 amp, specification grade commercial duty, back and side wired.

1. Basis-of-Design: Pass & Seymour; CSB20AC1 (single pole), CSB20AC2 (two pole), CSB20AC3 (three way), CSB20AC4 (four way).
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

C. Pilot Light Switches, 120/277V, 20 amp, single pole, with neon-lighted red handle, illuminated when switch is "ON." Hubbell - HBL1221PL.

1. Basis-of-Design: Pass & Seymour; PS20AC1RPL (120 v.), PS20AC1RPL7 (277 v.).
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

D. Key-Operated Switches, 120/277 V, 20 A: Single pole, with factory-supplied key in lieu of switch handle.

1. Basis-of-Design: Pass & Seymour; PS20AC1L.
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Basis-of-Design: Pass & Seymour; 1251.
2. Other manufacturers who may offer equal products include the following:
   a. Cooper
   b. Hubbell
   c. Leviton

2.9 WALL-BOX DIMMERS

A. Dimmer Switches: Refer to drawings for specification and characteristics.

2.10 OCCUPANCY SENSORS

A. Wall-Box Sensors:

1. Description: Dual Technology ultrasonic /passive-infrared type, 120/277v (or low voltage when used with remote power packs), selectable for Occupancy (auto-on/off) or Vacancy (manual-on, auto-off) modes, selectable time delay of 4,8,15, or 30 minutes, 180-degree field of view with a coverage area of 1,000 sq. ft., photocell override, single or dual level control with override button for each circuit, with 5-year warranty.
   a. Hubbell LightHAWK2, exact model and features as indicated on the drawings,
   b. or equal by one of the following:
      1) Cooper
      2) Leviton
      3) Pass & Seymour
      4) Watt Stopper (The)
      5) Lutron

B. Wall-Box Sensors/Dimmer:

1. Description: Digital passive-infrared type, 120/277v (or low voltage when used with remote power packs), selectable for Occupancy (auto-on/off) or Vacancy (manual-on, auto-off) modes, selectable time delay of 4,8,15, or 30 minutes, 180-degree field of view with a coverage area of 1,000 sq. ft., photocell override, single level control with override button and dimmer pushbuttons (raise and lower), with 5-year warranty.
   a. Hubbell LightHAWK2 LHD-IRS, exact model and features as indicated on the drawings,
   b. or equal by one of the following:
      1) Leviton
      2) Pass & Seymour
      3) Watt Stopper (The)
      4) Lutron

C. Ceiling Mount Sensors:

1. Description: Ultrasonic/passive infrared ceiling sensor, relay and photocell, 24vDC, selectable for Occupancy (auto-on/off) or Vacancy (manual-on, auto-off) modes, self-adjusting time delay of 8- 30 minutes, 360-degree field of view with a coverage area of 1,000 sq. ft., photocell override, with matching remote power pack, 5-year warranty.
   a. Hubbell OMNI-DT-1000, exact model and features as indicated on the drawings
   b. or equal by one of the following:
      1) Leviton
      2) Pass & Seymour
      3) Watt Stopper (The)
      4) Lutron

2.11 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces:
   a. Smooth, high-impact thermoplastic nylon with beveled edges.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic with beveled edges
4. Material for Damp Locations: Heavy duty cast aluminum with spring-loaded and gasketed lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof “In-Use” Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum or thermoplastic with lockable cover.

2.12 FLOOR SERVICE FITTINGS

A. Type: Modular, flap-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: [Rectangular] [Round], [die-cast aluminum] [solid brass] with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening or modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable as indicated on Drawings.

2.13 MULTIOUTLET ASSEMBLIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold Company (The).

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard white or off-white finish.

D. Wire: No. 12 AWG.

2.14 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Almond, Brown, Ivory, or White as selected by Architect/Engineer, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red body and faceplate.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles ‘up’, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify area served or type luminaire(s) each switch controls on wall plate. Also, Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant adhesive label tape on face of cover plate, with black lettering on light cover or white lettering on dark cover, and durable wire markers or tags on conductors inside outlet boxes.
2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant adhesive label tape on face of cover plate, with black lettering on light cover or white lettering on dark cover, and durable wire markers or tags on conductors inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Ground Impedance: Values of up to 2 ohms are acceptable.
3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
4. Using the test plug, verify that the device and its outlet box are securely mounted.
5. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

3.4 CLEANING

A. Clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates on devices.

END OF SECTION 26 2726

SECTION 26 5110 – LIGHTING FIXTURES (LED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior and exterior lighting fixtures.
2. LED light engines and drivers.
3. Emergency lighting units and battery units.
4. Exit fixtures.
5. Lighting fixture supports and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Driver characteristics and energy-efficiency data.
4. Life, output, and energy-efficiency data for LED engines.
5. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the fixtures are shown and coordinated with other items, based on input from installers of the items involved:

D. Maintenance Data: Submit maintenance data and parts list for each luminaire and accessory; including product data, and shop drawings in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL or other testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other ceiling construction items, including grids, HVAC equipment, fire-suppression system, and partition assemblies.

1.6 DELIVERY AND STORAGE

A. Deliver luminaires in factory-fabricated containers or wrappings, which properly protect luminaires from damage. Handle luminaires carefully to prevent damage, breaking and scoring of finishes. Do not install damaged units or components; replace with new.

B. Store luminaires in original packaging. Store inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity, laid flat and blocked off ground.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design and specification is based on the manufacturers' products noted or scheduled on drawings. Subject to the compliance with these specifications and Architect/Engineer approval, the following manufacturers may provide equivalent products. In the event that an equivalent item will require revisions or additions to any Work, the costs of such Work, including costs to other contractors, shall be performed at no change in the Contract Sum.

1. The Architect/Engineer reserves the right to reject any submitted products which do not meet the same level of quality, photometric performance, energy efficiency, finish, aesthetic qualities, features, or other criteria as determined by the A/E to be not acceptable. The Architect/Engineer reserves the right to request samples of alternate manufacturers' products prior to completing review of fixture submittal. Samples shall be delivered to the designated location for review at no cost to the Owner or Architect/Engineer.

B. Troffers, recessed and surface mounted, industrials, strips

1. Columbia
2. H.E. Williams
3. Metalux
4. DayBrite
5. Lithonia

C. Downlights

1. Prescolite
2. Kirlin

3. Gotham
4. Halo
5. Juno

D. Exterior units

1. Architectural Area Lighting
2. Kenall
3. Hubbell
4. Sternberg
5. Bega

E. Exit Fixtures and Emergency Battery Units

1. Dual-Lite
2. Emergi-Lite
3. Sure-Lites
4. Lithonia

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. General: Provide luminaires, of sizes, types and ratings indicated; complete with housing, LED engines, drivers, trim, accessories and wiring.

B. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

C. Fixtures: Comply with UL 1598.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging. Free of burrs and sharp corners and edges.

E. Doors, Frames, and Other Internal Access: Construct luminaires with concealed hinges and latches, with metal parts grounded as common unit, and so constructed as to dampen ballast generated noise. Housing shall be free of light leakage under operating conditions, and designed to permit relamping without use of tools. Construct to prevent doors, frames, lenses, diffusers, and other components from falling during relamping and when secured in operating position.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic UV stabilized plastic, minimum of 0.125 inch thick, high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 EMERGENCY POWER UNIT (INTEGRAL TO FIXTURE)

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with LED driver. Comply with UL 924.

1. Emergency Connection: Operate LED engine at a reduced lumen output, output varies per scheduled fixture and model number. Wire an un-switched circuit connection to battery-inverter unit and a switched circuit connection to fixture ballast, unless otherwise noted on the drawings.
2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

2.4 LED LIGHTS

A. LED Light Engine: Light engine shall utilize remote phosphor lens and mixing chamber to ensure perfectly mixed light, resulting in uniform colors and superior color consistency from fixture to fixture. Provide 2700K, 3000K, 3500K and 4100K color temperatures as scheduled or selected by Architect/Engineer. CRI shall be greater than 80. Cast aluminum heat sink integrated directly with housing provides thermal management. LEDs shall operate below manufacturer's published junction temperature to ensure attainment of rated life of the LEDs. Light engine shall mount directly to heat sink and be easily replaceable.

B. LED Driver: Universal driver accommodates 120V to 277V input volts AC at 50/60Hz. Power factor shall be greater than 0.9. Unit shall be easily replaceable from above or below the ceiling. Rated life shall be a minimum of 50,000 hours at 70% lumen maintenance.

    1. Dimming: Where scheduled, driver shall be dimmable via 0-10V protocol, increasing efficiency up to 30% while dimming.

2.5 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

    1. Lamps for AC Operation: strip-type LEDs, 70,000 hours minimum rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    1. Battery: Sealed, maintenance-free, nickel-cadmium type, capacity as scheduled.
    2. Charger: Fully automatic, solid-state type with sealed transfer relay.
    3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored,

relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Provide unit-mounted lamp head where indicated
5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
6. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Cage Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures, when specified on drawings.

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Factory-finish shall match fixture or as selected.

C. Twin-Stem Hangers: Two 1/2-inch steel tubes with single canopy designed to mount a single fixture. Factory-finish shall match fixture or as selected.

D. Hanger Wires (concealed lay-in fixtures): ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Rod Hangers: 3/16-inch minimum diameter, zinc or cadmium-plated, threaded steel rod, for use in unfinished areas.

F. Cable Hangers: Integrated assembly matched to fixture and equipped with factory-furnished attachments, flexible cord, and canopy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of 4 ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Install flush mounted luminaires properly to eliminate light leakage between luminaire frame and finished surface.

E. Provide plaster frames for recessed luminaires installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results.

3.3 CLEANING AND ADJUSTING

A. Clean interior lighting luminaires of dirt and construction debris upon completion of installation, or at date of substantial completion, whichever is the nearest to final completion.

B. Adjust aimable luminaires to provide required light intensities and directional aiming.

C. At Date of Substantial Completion, replace lamps in interior luminaires which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Engineer.

3.4 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit and Exit Fixture Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining 4 years.

B. Special Warranty for LED Drivers and Light Engines: Manufacturer's standard form in which manufacturer agrees to repair or replace LED light engines and/or drivers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for LED Drivers and Light Engines: Five years from date of Substantial Completion.

END OF SECTION 26 5110

SECTION 27 1506 – COMMUNICATIONS CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pathways.
2. Category 6 enhanced UTP cabling.
3. Fiber Optic Cable.
4. Cable connecting hardware and patch panels.
5. Telecommunications outlet/connectors.
6. Cabling system identification products.
7. Cable management system.
8. Grounding and bonding.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

G. RCDD: Registered Communications Distribution Designer.

H. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications workstation outlet/connector and the horizontal patch panel located in the communications equipment room.

1. Horizontal cabling shall not contain a transition point or splices between the patch panel and the telecommunications workstation.
2. Bridged taps and splices shall not be installed in the horizontal cabling.

B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or for the length of 16 feet in the horizontal cross-connect.

1.5 BACKBONE (RISER) CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone and/or riser cables, intermediate and main cross-connects, mechanical terminations,

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.6 PERFORMANCE REQUIREMENTS

A. General: Horizontal cabling system shall comply with transmission standards in the latest edition of:

1. ANSI/TIA-568-C.0 “Generic Telecommunications Cabling for Customer Premises”.
2. ANSI/TIA-568-C.1 “Commercial Building Telecommunications Cabling Standard”.
3. ANSI/TIA-568-C.2 “Balanced Twisted-Pair Telecommunications Cabling Standard”.
4. ANSI/TIA-568-C.3 “Generic Telecommunications Cabling and Components Standard”.

B. Structured Cabling Performance: The specified “Enhanced Category 6” horizontal cabling system shall provide a total usable bandwidth of 250 MHz and shall deliver verified channel performance of 5 dB above all Cat 6 crosstalk and 3 dB return loss requirements for standards-compliant installations.

1.7 SUBMITTALS

A. Product Data: For each type of cable and product specified.

B. Samples: For UTP and fiber optic cable, workstation outlets, identification labels.

C. Qualification Data: For installation supervisor and field inspector.

D. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Supports: UL labeled for support of Category 6e cabling, designed to prevent degradation of cable performance and pinch points that could damage cable. Use products as recommended by the cable manufacturer.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Conduit shall be minimum 1” size, with sweep bends wherever possible.
2. Outlet boxes shall be double-gang, 2-1/2 inches deep.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Berk-Tek; Nexans Company.
2. Belden Cable.
3. Genesis Cable Products; Honeywell International, Inc.
4. Mohawk; a division of Belden CDT.
5. SYSTIMAX Solutions.
6. 3M.

B. Description: 100-ohm, 4-pair UTP, 23 AWG solid copper insulated with FEP, covered with a thermoplastic flame-retardant PVC jacket; enhanced Category 6. Basis of Design is Berk-Tek LANmark-1000 to provide a minimum of 5db of crosstalk margin above the Cat 6 standard.

1. Comply with ICEA S-90-661 for mechanical properties.
2. ETL Verified to exceed TIA/EIA-568-C.2 Category 6.
3. Listed and labeled as complying with UL 444 and NFPA 70 and 262 for the following types:
   a. Communications, Plenum Rated: Type CMP.
   b. Communications, Riser Rated: Type CMR.
4. Jacket Color:
   a. Data: Blue
   b. Voice: Gray
   c. CCTV: Yellow
   d. Door Access: Purple
   e. Lighting Control: Green

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Premise Wiring.
2. Leviton Voice & Data Division.
3. Panduit Corp.
4. Siemon Co.

B. General Requirements for Cable Connecting Hardware: Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Connecting hardware to be of same category or higher as the specified UTP cabling.

C. Patch Panel: Flat modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables, universal wiring for both T568A and T568B. Siemon HD6 or equal.

1. EIA Standard 19 rack mounting. Provide with rear cable manager, icon label holders and designation labels, cable ties, and mounting hardware.
2. Number of Jacks: One for each UTP cable indicated, plus 30 percent spares and blank positions.
3. Connecting Blocks: 110-style IDC for Category 6. Integral with connector bodies, including plugs and jacks where indicated.

D. Jacks and Jack Assemblies: Cat 6, balanced, twisted-pair connector; four-pair, eight-position modular, angled, T568A and T568B wiring options. Provide rear strain relief cap, protective rubber door, color as indicated. Comply with TIA/EIA-568-C.1. Siemon MAX MX-6 or equal.

2.4 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Corning Cable Systems.
2. General Cable Technologies Corporation.
3. Mohawk; a division of Belden CDT.
4. SYSTIMAX Solutions; a CommScope, Inc.
5. 3M.
6. Tyco Electronics/AMP Netconnect;

B. Description: Multimode, 50/125-micrometer, tight buffer, optical fiber cable with strands as indicated on drawings. For outdoor plant fiber, provide outside plant cable in conduit with UV-resistant jacket and gel-filled buffer tube or other waterblocking technology, rated for indoor/outdoor use, with no need for an indoor transition splice when entering the building.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   a. General Purpose, Nonconductive: Type OFN, OFNG**,** OFNR, or OFNP.
   b. Plenum Rated, Nonconductive: Type OFNP.
   c. Riser Rated, Nonconductive: Type OFNR or OFNP.
4. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
5. Minimum Modal Bandwidth: 1500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Imprinted with fiber count, fiber type, and aggregate length at regular intervals.

2.5 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. Corning Cable Systems.
3. Hubbell Premise Wiring.
4. Molex Premise Networks; a division of Molex, Inc.
5. Siemon Co.

B. Fiber Patch Panels: Flat modular panels housing multiple-numbered connectors at each jack for permanent termination of installed fiber strands. Siemon FCP3-DWR or equal.

1. EIA Standard 19 rack mounting. Provide with removable sliding drawer tray, front fiber clips, removable label holder, fiber cable tabs and anchor points, adapter mounting plates. Provide splice tray with sleeve splice holders and clear cover.
2. Adapters: One for each fiber strand indicated, duplex arrangement, quick connect, Type SC or ST, universal to support singlemode and multimode fiber.

C. Cable Connecting Hardware:

1. Comply with FOCIS specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC or Type ST connectors. Insertion loss not more than 0.75 dB.

2.6 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Belden CDT Inc.; Electronics Division.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka USA.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz. UL 13 and 444 listed, RoHS compliant.

2.7 WORKSTATION OUTLETS

A. Jacks: Cat 6, balanced, twisted-pair connector; four-pair, eight-position modular, angled, T568A and T568B wiring options. Provide rear strain relief cap, protective rubber door, color as indicated. Comply with TIA/EIA-568-C.1. Siemon MAX MX-6 or equal.

B. Outlets: Multi-port assemblies as indicated on Drawings, mounted on single-gang cover over a double gang wallbox.

1. Faceplate: High-impact plastic single-gang with 45-degree angled module mounting, for use with snap-in jacks, accommodating up to four UTP jacks.
2. Match faceplate color with receptacles per Division 26 Section "Wiring Devices." Provide a slide-in color coded icon insert above each jack.
   a. Data shall be “blue”
   b. Voice shall be “gray”

3. Identification legend: Snap-in, clear-label cover over a paper insert. Labels shall be machine-printed, to match labeling specified protocol. Each jack shall be uniquely identified.

2.8 EQUIPMENT FRAMES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hubbell Premise Wiring.
3. Leviton Voice & Data Division.
4. Ortronics, Inc.
5. Panduit Corp.
6. Siemon Co.

B. Equipment Rack – Floor Mounted:

1. General: Two-post freestanding, extruded aluminum or welded steel units with two 3-inch uprights and base, two top angles, 1200 pound load rating, UL-listed.
2. Dimensions: 19-inch panel width compatible with EIA 310-D standard. Overall height of 84 inches (minimum).
3. Anchors and supports: Provide (4) 3/8 inch x 3 inch long anchor bolts and wedge anchors for base attachment to concrete floor structure. Provide a 12-inch wide horizontal runway with stringer caps and angle bracket to stabilize top of rack to wall.
4. Cable Management: Cable management accessories shall be metal, with integral wire retaining fingers. Provide 3-5/8 inch wide single-sided vertical cable management to include hinged removable doors, cable straps mounts, retained bars, gates and mounting hardware. Provide a 2U horizontal crossover cable manager above and below each patch panel. Baked-polyester powder coat finish, black.
5. Accessories: Provide (1) single-sided ventilated 15 inch deep CPU shelf per rack, 100 pound load rated. Provide (1) rack mounted copper ground bar with mounting hardware per rack.
6. Finish: Manufacturer's standard, black baked-polyester powder coat.

C. Equipment Rack - Wall Cabinets:

1. Construction: Welded 16 gauge steel dual hinge cabinet, reversible left or right hinge swing, lockable solid steel front door, louvered side panels, grounding lug, UL Listed, 150 pound load rating. All cabinets keyed alike.
2. Dimensions: 36 inch high cabinet with 19 mounting units available, 25 inches wide x 25 inches deep.
3. Finish: Manufacturer's standard, black baked-polyester powder coat.

2.9 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 6 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.10 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.11 SOURCE QUALITY CONTROL

A. Factory test UTP cables according to TIA/EIA-568-C.2.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Conceal raceway and cables except in unfinished spaces or in areas without ceilings.

1. Install cables in raceways where indicated
2. Use unenclosed wiring method for cables in accessible ceiling spaces, attics, and within gypsum board partitions.
3. Install plenum-rated cable in environmental air spaces, including plenum ceilings.

B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

D. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to cable trays where cable trays are indicated.
2. Install cable trays to route cables where indicated.
3. Secure conduits to backboard when entering room from overhead.
4. Extend underground/underfloor conduits up 12 inches above finished floor against wall.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels. Cables may not be spliced.
5. Secure and support cables at intervals not exceeding 48 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 3-foot long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Chapter 4.

C. UTP Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA-568-C.3.
2. Cable shall be terminated on specified connecting hardware.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable, where not in conduit or cable tray, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with, or supported from, pipes, ducts, or potentially damaging items.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables and unshielded power conductors or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 5 kVA: A minimum of 12 inches.
   b. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 5 kVA: A minimum of 6 inches.
   b. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines or electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating More Than 2 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

C. Bond metallic equipment racks, cable trays, cabinets, etc. to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

D. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1.
2. Visually confirm marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
5. UTP Performance Tests:
   a. Test for each outlet. Perform all tests according to TIA-568-C.1 and TIA-568-C.2.
6. Fiber Optic Tests:
   a. Test each fiber cable according to TIA-568-C.3.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 27 1506

SECTION 28 3121 – FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes furnishing, installation, and connection of a microprocessor controlled, analog addressable, intelligent fire alarm equipment as required to form a complete coordinated fire alarm and detection system ready for operation.

1.3 DEFINITIONS

A. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. The system supplied under this specification shall be a UL-listed modular fire alarm and detection system that uses independently addressed fire detection devices, input/output control modules, and notification appliances.

B. The system shall be fully field programmable such that virtually any combination of system output functions may be correlated to any type of input event(s). All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panels. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

C. Intelligent addressable analog system, with automatic sensitivity control of smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

D. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and shall monitor the integrity of all conductors.

E. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

1.5 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect/Engineer.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified in fire-alarm system design.

b. NICET-certified fire-alarm technician, Level III minimum.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans and duct details coordinating installation of duct smoke detectors and access to them. Locate detectors according to manufacturer's written recommendations.
6. Include single-line connection diagram.
7. Include floor plans to indicate final device locations showing address of each addressable device. Show size, type and route of cable and wiring.

D. Field quality-control reports.

E. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Comply with the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72.
3. Record copy of site-specific software and device address list.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72
5. Manufacturer's maintenance requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be supervised by personnel certified by NICET as fire-alarm Level II technician as a minimum.

C. Electrical Components, Devices, and Accessories: Listed and labeled, and marked for intended location and application.

D. Products shall be Underwriters Laboratories Inc. (UL) – USA listed:

No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems
No. 268A	Smoke Detectors for Duct Applications
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances

No. 38 Manually Actuated Signaling Boxes
No. 346 Waterflow Indicators for Fire Protective Signaling Systems
No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
No. 1971 Visual Notification Appliances

E. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide quantity of each device as indicated (x) for each building fire alarm system:

1. Smoke Detectors: (3)
2. Heat Detectors: (3)
3. Pull stations: (2)
4. Audible and Visual Notification Appliances: (2) of each type installed.
5. Addressable Modules: (1) of each type specified
6. Shields/Guards: (2)
7. Keys and Tools: (3) sets for access to lockable components.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide a fire alarm system consisting of products as provided by Edwards/EST Life Safety and Communications or approved equal. EST product numbers are used below as the Basis-of-Design.

B. Subject to the compliance with these specifications, other listed manufacturers may provide equivalent in quality products. If an equivalent system will require revisions or additions to the system as designed, the Contractor must coordinate the installation and bear all costs of revisions or additions to the work.

1. Simplex-Grinnell
2. Siemens
3. Notifier/Honeywell

C. All devices shall be UL-listed by the manufacturer as being compatible with the fire alarm panel furnished for the project.

2.2 SYSTEM DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Activate alarm notification system.

3. Identify alarm at fire-alarm control unit, and remote annunciator(s) when provided.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Release fire and smoke doors held open by magnetic door holders.
6. Shutoff HVAC equipment controls due to duct detection.
7. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciator(s).

2.3 SYSTEM OPERATION

A. General Alarm: Actuation of any initiating device (manual station, smoke detector, heat detector or water flow switch) shall cause the following operations to occur:

1. Activate all programmed alarm notification circuits until silenced.
2. Activate all visual notification (strobe) units until the panel is reset.
3. Annunciate the location of the active initiating device(s) at the main panel and remote annunciator panel(s).
4. Initiate remote communication to off-site monitoring service via telephone connection
5. Release all magnetic door holders at doors on the floor where the alarm was initiated.
6. Initiate elevator recall sequence.

B. Elevator Functions:

1. Recall: Smoke detector activation in any elevator lobby shall, in addition to initiating a general alarm, activate the return of all associated elevators to the primary floor of egress, or alternate floor if the primary floor detector is in alarm.
2. Fire Hat: Smoke detector activation in the elevator machine room or top of hoistway shall initiate the ‘fire hat’ signal in the elevator cab and cause a general alarm.

3. Power Shunt Trip: Where sprinklers are installed in elevator hoistway or machine room, a heat detector shall be installed within 3 feet of each sprinkler head. The detector's temperature rating shall be selected lower than the associated sprinkler element such that the heat detector will initiate shutdown of elevator power through the elevator control switch prior to waterflow, in accordance with ANSI A17.1 requirements.
4. All work related to the elevator control sequences shall be coordinated with the elevator installer, or approved elevator service agency where elevator is existing, to accomplish the required functions.

C. Fire Suppression Systems:

1. Activation of any sprinkler waterflow switch shall initiate a general alarm condition.
2. Activation of any sprinkler system low pressure switch or valve tamper switch shall initiate a system supervisory alarm indication.
3. Fire pump controller shall be monitored for trouble/supervisory condition.
4. Upon activation (manual or automatic) of the kitchen hood suppression system a general alarm shall be initiated, the associated hood exhaust fan shall stop, and any gas fuel solenoid valve or power shunt trip breaker shall be activated to disconnect gas or power to the associated appliances.

D. Duct Detectors:

1. Activation of a duct type smoke detector shall initiate a general alarm and shall also cause shutdown of the associated air distribution fan(s). This function shall be coordinated with the temperature control installer.
2. Activation of a duct mounted smoke detector installed at a smoke damper shall initiate a general alarm and shall also shall cause the damper to close. This function shall be coordinated with the temperature control installer.

E. FIRE-ALARM CONTROL PANEL

F. Manufacturer: EST Model iO Series with modules, cards, power supplies as required.

G. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
   a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
   b. Include a real-time clock for time annotation of events on the event recorder and printer.
2. Addressable initiation devices that communicate device identity and status.
   a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
   b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

H. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters (4 x 20) minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

I. Circuits:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.
4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

J. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

K. Notification Appliance Circuit: Operation shall sound in an approved pattern.

L. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

M. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

N. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

O. Secondary Power: 24-V dc supply system with batteries, automatic dual-rate battery charger, and automatic transfer switch.

1. Batteries: 24-hour capacity, Sealed lead calcium or sealed, valve-regulated, recombinant lead acid. The batteries are to be completely maintenance free.
2. Battery charger shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions.

2.4 NAC POWER PANEL

A. Power Extender Panel shall be a stand-alone panel capable of powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be Class A, Style Z rated at 2 amps each.

B. The internal power supply & battery charger shall be capable of charging up 12.7 Amp-hour batteries internally mounted or 18Amp-hour batteries mounted in an external cabinet.

C. Alarms from the host fire alarm control panel shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

2.5 ALARM COMMUNICATOR

A. A Digital Alarm Communicator Transmitter (DACT) shall be provided in the main fire alarm control panel.

B. A compatible UL-listed programmable and selectable Single or Dual Path Communicator (SDPC) shall be provided adjacent to or within 20 feet of the fire alarm control panel. The SDPC shall be capable of cellular transmission only, or IP/internet transmission only, or IP primary with cellular backup. The SDPC shall be fully redundant and monitored 24/7. The single path communication protocol allows one technology (either IP or cellular) to be used to provide connectivity. For added reliability, or when dual path connectivity is required by the local AHJ, the SDPC shall be configured to use both technologies.

1. SDPC shall be Honeywell IPGSM-4G, or equal by Bosch or StarLink and shall be listed for use with the fire alarm control panel.

C. Functional Performance: The Fire Alarm System shall automatically initiate an alarm, supervisory, or trouble signal in Contact ID Format from the fire alarm control panel DACT through the SDPC to the Owner's designated central monitoring station. When contact is made with the central station, signals shall be transmitted. If service is lost on both outputs, transmitter shall initiate a supervisory signal.

D. Secondary Power: Integral rechargeable 24 hour battery and automatic charger.

E. Supervision Self-Test: Conducted automatically on a timed frequency based on the single or dual path configuration, as required by NFPA 72, with a report transmitted to central monitoring station.

2.6 MANUAL FIRE-ALARM PULL STATIONS

A. Manufacturer: EST Model SIGA-278, with STI-1130 shield where indicated.

B. General Requirements for Manual Fire-Alarm Stations: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.7 SMOKE DETECTORS

A. General Requirements for Smoke Detectors:

1. Comply with UL 268: operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

B. Photoelectric Smoke Detectors (EST Model SIGA2-PS)

1. Detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

C. Duct Smoke Detectors: Photoelectric type (EST Model SIGA –SD with remote test station)

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X, NRTL listed for use with the supplied detector.
3. Each sensor shall have multiple levels of detection sensitivity.

4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
6. Remote Test Station: LED status indicators, key-operated test switch, recessed mounting with flush cover plate, labeled to identify device controlled.

2.8 HEAT DETECTORS (EST Model SIGA2-HRS w/ SIGA-SB base)

A. General Requirements for Heat Detectors: Comply with UL 521.

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and be field-selectable with or without a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute.
2. Mounting: Twist-lock base interchangeable with smoke-detector bases.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.10 CARBON MONOXIDE DETECTORS (EST-SIGA COD w/ AB4GT base)

A. Provide intelligent carbon monoxide detectors and sounder bases at the locations shown on the drawings.

B. The CO detector shall be listed to UL2075. The alarm level threshold limits shall be per UL 2034. Each CO detector shall provide a signal to the control panel for programming system responses.

1. Mount each CO detector on a sounder base such that the detector shall initiate a local temporal TC4 tone signal when CO is detected.
2. The electro-chemical CO sensor shall generate a CO alarm in compliance with UL-2034 requirements. The sensor shall have a nominal ten-year life.
3. Performing a “sensitivity” check from the panel shall report the approximate number months of sensor life remaining. When the sensor approaches the end of its useful life, it shall transmit a maintenance condition to the control panel, indicating the CO sensor board replacement is required. Only when the sensor is no longer operational shall a trouble condition be sent to the control panel.
4. Detectors that transmit a common trouble indication for both sensor end-of-life and other causes of detector trouble shall not be considered as equal.
5. Placing the CO detector in test mode shall facilitate the use of direct injection of small quantities of CO to check detector functionality.

2.11 DETECTOR BASES

A. Provide standard detector bases suitable for mounting on either 3½ or 4 inch octagon box or 4 inch square box. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections. The base shall contain no active electronics and support all detector types. Removal of the respective detector shall not affect communications with other detectors.

2.12 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for semi-flush or surface mounting as indicated with red factory finish and with screw terminals for system connections.

1. Fire Alarm notification appliances shall be provided with wording (FIRE), and with a clear strobe lens.

B. Horns: (EST Model G1RF-HD)

1. Electric-vibrating-polarized type, 24-V dc, with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
2. Weatherproof housing for outdoor locations (EST 757 Series horn w/ weatherproof box)

C. Visible Notification Appliances: (EST Model G1RF-VM)

1. Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
2. Rated Light Output: 15/30/75/110 candela (cd), selectable in the field.
3. Mounting: Wall mounted unless otherwise indicated.
4. Flashing shall be in a temporal pattern, synchronized with other units.

D. Combination Devices: (EST Model G1RF-HDVM)

1. Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

2.13 REMOTE ANNUNCIATOR (EST Model RLCD-C)

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Alphanumeric LCD display and LED status indicating lights shall match those of fire-alarm control unit. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet unless conditions require surface mounting, NEMA 250, Type 1.

2.14 ADDRESSABLE INTERFACE DEVICES

A. Addressable interface modules shall be provided as indicated for monitoring or controlling building components. The modules shall mount in a standard single-gang electrical box. Provide mounting bracket and cover plate with LED status indicator.

1. Addressable Monitor Module (EST Model SIGA-CT1): NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with

normally open contacts. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.

2. Addressable Relay (control) Module (EST Model SIGA-CR): shall be provided to supervise and control the operation of devices (fan shutdown, door closure, damper closure) or other auxiliary control functions. The relay module may be set to operate as a dry contract relay. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

2.15 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, alarm appliance, or other device requiring protection. (Chase CWGP 776 or equal)

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

2.16 CONDUIT AND WIRE/CABLE

A. Conduit and Raceway: Refer to Part 3 for locations where conduit and surface raceway are required.

1. Conduit: Electrical metallic tubing, ¾” minimum, with fittings and boxes as specified in other sections.
2. Surface metal raceway systems: Complete with matching boxes and fittings, size as required by application.

B. Wire and Cables

1. Wiring shall be in accordance with applicable codes (NEC Article 760) and as recommended by the manufacturer of the fire alarm system.
2. All fire alarm system wiring and cables must be new and be color-coded red
3. Number and size of conductors or cables shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and signaling line circuits, and 14 AWG for notification appliance circuits.
4. Wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
5. Wire and cable not installed in conduit shall have a plenum-rated fire resistance rating as indicated in NFPA 70 (FPLR).
6. Conductors in conduit shall be type THHN/THWN-2 insulated copper conductors.

C. Terminal Boxes, Junction Boxes and Cabinets

1. All boxes and cabinets shall be UL listed for their use and purpose.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

C. Device Mounting: All fire detection and alarm system devices, control panels and remote annunciators shall be installed as follows:

1. Accessible ceilings (lay-in ceilings or suspended drywall or similar construction).
   a. Flush mounted devices with recessed box and concealed wiring/conduit.
2. Inaccessible ceilings (exposed 'open' structure or inaccessible ceilings).
   a. Unfinished spaces: Surface mounted devices using exposed conduit and boxes.
   b. Finished spaces: Surface mounted devices using surface raceway.
3. Hollow walls (stud walls or hollow CMU).
   a. Flush mounted devices with recessed box and concealed wiring in conduit.
   b. Surface devices with exposed conduit may be used only in unfinished spaces (mechanical / electrical rooms or similar areas) or as approved by the Architect/Engineer.
4. Solid walls (solid masonry)
   a. Surface mounted devices with surface raceway system.
      1) Exposed conduit may be used only in unfinished spaces (mechanical / electrical rooms or similar areas as defined by the Architect).

D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet where in the direction of airflow, or 5 feet otherwise, from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Install remote test station in public area below concealed detectors or in accessible area within mechanical areas.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Locate detectors within two feet of associated sprinkler.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

H. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.2 WIRING METHODS

A. General: All fire alarm system wiring shall be installed concealed wherever possible. Fire alarm wiring shall generally consist of open cabling run supported above accessible ceilings.

1. Install wiring in cable tray where indicated or else use approved cable straps attached directly to structure.
2. No wiring shall lie directly on ceilings. No wiring shall be strapped or tied to piping, ductwork or conduits
3. Install wiring in conduit in open structure areas.

B. Conduit and Raceway:

1. All conduit and junction boxes shall be concealed in finished areas and may be exposed in unfinished areas.
2. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
3. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
4. All conduit, mounting boxes, junction boxes and panels are to be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system.
5. Fire alarm cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
6. Conduit sleeves with fire-stopping shall be provided where open wiring penetrates floors or fire-rated partitions.

C. Wiring:

1. Wire and cable types and minimum size shall be as recommended by the equipment manufacturer. However, the size shall not be less than specified or shown on the drawing/riser diagram. The contractor shall not use any wire or cable not recommended by the equipment supplier.
2. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This panel circuit breaker shall be labeled as FIRE ALARM. The control panel shall be grounded using a #10 AWG conductor.
3. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
4. All field wiring shall be electrically supervised for open circuit and ground fault.

5. All conductors and cables shall be installed without the use of splices unless permitted by the manufacturer.
6. Cable lubricants shall be used only as permitted by the manufacturer.
7. Flexible connectors are to be used for all devices mounted in suspended lay-in ceiling panels.
8. No wiring other than fire alarm detection, alarm or auxiliary functions will be permitted in fire alarm raceways.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Install framed instructions in a location visible from fire-alarm control unit.
2. Junction boxes shall be painted fire alarm red and identified with ‘FA’ in black on cover.

B. Identify location of above-ceiling detectors by applying a 1/2” diameter red vinyl ‘dot’ with adhesive back on the ceiling grid below the device.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits: comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect/Engineer, Owner, and authorities having jurisdiction (AHJ).

B. Field Service: Engage a factory-trained technician, or a trained and NICET Level II qualified technician, to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports. Submit copies to the Architect/Engineer for review. Submit final approved copies in Operation & Maintenance Manuals.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Formal on-site training shall be provided to the Owner's representative/maintenance personnel and shall include instructions in the location, inspection, maintenance, testing and operation of all fire alarm system components.

B. Provide minimum of (4) hours of general instruction. Provide a signed copy of the name of the personnel giving the instructions and the personnel of the Owner who were instructed.

END OF SECTION 28 3121

SECTION 31 2000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Special Project Stipulation: Contractor's schedule shall include a 7 calendar days pause of construction activities with-in the foundation limits. This time is to allow the owner's representatives to survey the excavated area for archeological items. Refer to Div 0 – Contract requirements for additional pause procedures should obvious human artifacts be uncovered during excavation.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase and base course for asphalt paving
5. Subbase course for concrete walks and pavements.
6. Excavating and backfilling trenches within building lines.
7. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:

1. Division 31 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
2. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
3. Division 31 Section "Soil Erosion and Sediment Control".

1.3 DEFINITIONS

A. Backfill: Soil and rock materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt pavement, or layer placed between the subgrade and concrete or walk.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Architect or CM. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect or CM. Unauthorized excavation, as well as remedial work directed by Architect or CM, shall be without additional compensation.

G. Fill: Soil or rock materials used to raise existing grades.

H. Structures: Buildings, footings, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Drainage fabric.
3. Separation fabric.

B. Samples: For the following:

1. 12-by-12-inch (300-by-300-mm) sample of drainage fabric.
2. 12-by-12-inch (300-by-300-mm) sample of separation fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D1557 for each on-site or borrow soil material proposed for fill and backfill.

D. Blasting plan approved by authorities having jurisdiction, for record purposes.

E. Seismic survey firm report, for record purposes.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

B. Seismic Survey Firm: An independent professional firm, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring services during blasting operations.

C. Geotechnical Engineering Firm Qualifications: An independent professional firm qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548.

D. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings" and with authorities having jurisdiction

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1. Site Information: Data in subsurface exploration reports was used for the basis of design and is made available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity boring/test pits. The Owner, architect or cm will not be responsible for interpretations or conclusions drawn from this data by the contractor.

2. Additional test borings and other exploratory operations may be performed by the Contractors, at the Contractors option, however, no change in the Contract Sum will be authorized for such additional exploration.

3. Existing Utilities: The Contractor shall call 1-800-242-1776 “One Call System” as indicated prior to performing excavation work.
    a. Locate existing underground utilities in areas of excavation work prior to beginning excavation operations. Visibly mark or stake existing utilities for the duration of the project. If utilities are indicated to remain in place, provide adequate means of protection during earthwork operations.

    b. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for direction. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of utility owner.

    c. Do not interrupt existing utilities serving facilities occupied by the owner or others, during occupied hours, except when permitted in writing by the Owner or Architect, then only after acceptable temporary utility services have been provided.

    d. Provide a minimum of 48 hours notice to the Owner and receive written notice to proceed before interrupting any utility.
    e. Demolish and completely remove from the site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

4. Protection of Persons and Property: Barricade all open excavation occurring as part of this work and post with warning lights.
    a. Operate Warning lights as recommended by authorities having jurisdiction. Traffic control for improvements along public roads shall be conducted in accordance with PennDOT Publication 213 and the requirements of authorities having jurisdiction.

    b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

    c. Perform excavation by hand within the drip line of large trees to remain. Protect root systems from damage or dryout to the greatest extent

possible. Maintain moist conditions for root system and cover exposed roots with moistened burlap.

5. Vertical Limits of Responsibility: Contractor is responsible for excavation to the required subgrade elevations (cut) and not more than the 16 inches below existing grade (fill) for bulk excavation and subgrade of structures and bottom of pipe, conduit, or footings for trench excavation.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide suitable borrow soil from a maximum of two sources when sufficient satisfactory soils are not available from excavations. **No slag is permitted.**

B. Topsoil: Fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds, and other litter and free of roots, stumps, stones larger than 2 inches in any dimension and other extraneous or toxic matter harmful to plant growth.

a. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at the project site. Obtain topsoil only from naturally, well drained sites where topsoil occurs in a depth of not less than four (4) inches; do not obtain from bogs or marches.

C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material shall be capable of obtaining the specified moisture content and compaction requirements.

D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

E. Backfill, fill and borrow materials: Satisfactory soil materials, reasonably free of clay (maximum 12 percent) and sand (maximum 18 percent) and completely free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material shall be capable of obtaining the specified moisture content and compaction requirements.

F. Subbase Material: Evenly graded mixture of natural or crushed gravel or crushed stone complying with PennDOT 2B or 2A modified stone as indicated on the drawings.

G. Base: Naturally or artificially graded mixture of natural or crushed gravel, c crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Engineered Fill: 2A modified natural stone or other material approved by geotechnical engineer.

I. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

J. Drainage Fill: Uniformly graded mixture of natural or crushed gravel, or crushed stone complying with AASHTO No. 57 (PennDot 2B) with 100 percent passing 1- ½ inch sieve and not more than 5 percent passing No. 4 sieve. Wash stone thoroughly.

K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

L. Impervious Fill: Clayey silt, gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards

created by earthwork operations. Contractor shall include engineering and installation of any required shoring to perform the required construction.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground, surface or as specified in Division 31 Section "Site Clearing."

D. Soil fill shall be compacted to a density of 95 percent of the maximum dry density, as determined by ASTM Standard D 698, Standard Proctor Test.

E. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

1. Do not damage adjacent structures, utilities, property, or site improvements or weaken the bearing capacity of rock subgrade when using explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation is **UNCLASSIFIED**: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

B. Excavation Parameters:

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials. No additional compensation will be made for any soil materials that can used on site.

2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. b. 12 inches (300 mm) outside of concrete forms at footings.

c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

e. 6 inches (150 mm) beneath bottom of concrete slabs on grade.

f. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

C. Earth Excavation Types: Earth Excavation includes bulk and trench earth excavation:

1. Bulk Earth Excavation: Bulk earth excavation includes excavation of subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures, final site contours and other construction operations by one of the following methods:

a. Hand Excavation: Hand excavation is defined as digging soil by hand shoveling, including loosening with a pick or other small tools and no more than total lift of six (6) feet. Unit prices shall include labor, materials and platforms and shoring if required, and disposal.

b. Machine Excavation: Machine excavation is defined as excavation requiring power equipment and includes transportation, set-up/unrigging and disposal.

2. Trench Earth Excavation: Earth excavation for trenches and pits includes removal and disposal of earth material required to accommodate footings, utilities, sanitary, storm and waste water piping, culverts and other subgrade site work. Trenches in excess of 10’-0” wide and pits in excess of 30’-0” in either length or width are classified as bulk excavation.

a. Hand Excavation: Hand excavation is defined as digging soil by hand shoveling, including loosening with a pick or other small tools and no more than total lift of six (6) feet. Unit prices shall include labor, materials and platforms and shoring if required, and disposal.

b. Machine Excavation: Machine excavation is defined as excavation requiring power equipment and includes transportation, set-up/unrigging and disposal.

D. Excavation Types: Excavation includes bulk and trench excavation.

1. Bulk Excavation: Bulk excavation includes removal and disposal of materials and obstructions. Comply with any of the following methods for removal of rock. Method must be approved by the Architect prior to commencing removal:

a. Blasting: ***Blasting is not permitted.***

F. Unauthorized Excavation: Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.
2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. Additional Excavation: When excavation has reached required subgrade elevations, perform subgrade testing and forward results to Architect before proceeding with the foundations/footing work. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue additional excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect.

Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

3.5 STABILITY OF EXCAVATIONS

A. General: Comply with federal, state and local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations as required. Shore, brace or line where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

1. Provide permanent steel sheet piling or pressure-creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of

soil under adjacent structures. Cut off tops a minimum of 2'-6" below final grade and leave permanently in place.

3.6 SINKHOLES:

A. Recommended Procedures for Minimizing Sinkhole Development in Carbonate Areas: Areas underlain by carbonate rock formations are subject to solution activity and the development of sinkholes. Any disturbance of natural conditions at a given site tends to increase the potential for sinkhole development. The following construction procedures will help to minimize this potential.

1. Utmost care must be taken to prevent collection and drainage of surface water into excavated or low-lying areas of the site during the excavation and construction of roadways, ramps, or structures. This may be done by constructing earth berms, dikes, or diversion ditches around open excavations or otherwise preventing the collection and ponding of water in low-lying areas.

2. The soil situated above a zone of solution activity is usually soft and wet. It is, therefore, important to locate areas exhibiting these conditions, wherever they may exist or be encountered. If structural fill is to be placed in areas suspected of sinkhole activity, the subgrade shall be proof-rolled and all soft areas suitable replaced and compacted prior to construction of the embankment. If the area is to be excavated, proof-rolling shall be conducted after excavating to the finished subgrade elevation. Proof-rolling shall be conducted using either a static roller weighing at least 10 tons or other equipment with a similar weight.
3. Soft soil areas shall be removed and replaced with a clean, granular soil compacted in layers. All compacted soil shall be compacted to a density of at least 98 percent of the maximum dry density, as determined by ASTM Standard D 698, Standard Proctor Test.

4. The base of all excavations in carbonate areas shall be checked for soft or unusually moist conditions. A visual examination of the excavated surface, as well as probes of the soil at regular intervals, is required. Any soft or unusually moist soil shall be further excavated and a determination of the extent of the problem be made. Remedial measures should then be undertaken as necessary.

5. Excavation should be kept to a practical minimum.

3.7 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area. Maintain positive slope of site excavation to prevent ponding of water on areas to receive paving or slabs.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction

and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches. Comply with soil erosion control plan.

3.8 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Prepare bottom of excavation to the requirements of the Geotechnical Engineer prior to the installation of foundations. Do not disturb bottom of excavations intended for bearing surface.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.9 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.10 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line or at elevation indicated on plan.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches (300 mm) on each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

3. Excavate trenches 6 inches (150 mm) deeper than elevation required in unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in unyielding bearing material to allow for bedding course.

3.11 APPROVAL OF SUBGRADE

A. Notify Architect or CM when excavations have reached required subgrade.

B. If Architect or CM determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade below building slabs, pavements, and special excavation with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades, unless otherwise directed by the Architect, CM or Geotechnical engineering firm.

1. Completely proof-roll subgrade in one direction, repeating proof rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof roll the footprint of the building and pavement area plus a 5-foot wide perimeter zone. Proof roll after the site has been stripped and prior to fill/backfill placement. Proof roll areas where it is necessary to excavate to reach the floor or pavement subgrade elevation after the excavation work is complete.

3. Proof roll using a rubber tire roller or a tandem axle dump truck that weighs at least 40,000 lbs and which has a tire pressure of at least 100 psi.

4. Apply a minimum of four complete coverages to the subgrade consisting of two coverages in one direction followed by two coverages in the transverse direction with the specified equipment.

5. Over excavate weak of soft areas exposed by pumping, weaving, rolling and/or cracking of the subgrade under the specified proof rolling equipment as follows:
   a. Pavement footprint and 5-foot wide perimeter zone-Over excavate to firm unyielding stratum or to a depth of 24 inches, whichever is less.

6. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by the architect or cm, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

E. Authorized additional excavation and replacement material will be paid for according to the Contract provisions for changes in the Work.

3.12 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill with a compressive strength not more than 1000 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect or cm.

3.13 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

B. Comply with the requirements of ACI 306R-88 and in particular, Chapter 4-Preparstion before Concreting.

3.14 STORAGE OF SOIL AND ROCK MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill. Place, grade, and shape stockpiles for proper drainage. ***Contractor shall be responsible to protect suitable soils stockpile as to maintain acceptable moisture content required for compaction.***

B. Maintain separate soil stockpiles from Work performed by others.

C. General Contractor is responsible for the final grading and seeding of the entire stockpile area at final completion, unless agreed to otherwise in writing by owner.

D. Locate and retain excavated materials away from edges of excavations. Do not store within the drip line of trees indicated to remain.

E. Dispose of excess excavated material and materials not acceptable for use as backfill or fill.

3.15 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for record documents.

3. Inspecting and testing underground utilities.

4. Removing concrete formwork.

5. Removing trash and debris.

6. Removing temporary shoring and bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrade free of mud, frost, snow or ice.

3.16 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.17 FILL

A. General: The contractor shall protect excavated material which he intends on reusing as fill or backfill. Contractor shall stock pile and protect excavated satisfactory soil and is responsible for maintaining the quality of this soil.

B. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

C. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

D. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use satisfactory soil material.

3. Under steps and ramps, also see alternate for stone building pad.

4. Under building slabs, also see alternate for stone building pad.
5. Under footings and foundations, also see alternate for stone building pad

E. Where voids are left by boulder removal use subbase or base material or satisfactory soil or borrow material.

F. Immediately under Portland Cement Concrete Paving and steps, use drainage fill material.

G. Under footings, piping, conduit and equipment that come in within 6 inches above rock bearing surface or for correction of unauthorized excavation, use satisfactory soils or subbase materials or engineered fill as directed by the Architect or cm.

H. Under footings and foundations where poor soil was removed, used engineered fill as directed by the architect or cm.

I. Place soil fill on subgrade free of mud, frost, snow or ice

3.18 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content. No additional compensation will be made for contractor to correct soils for optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight. No additional compensation will be made for the contractor to manage soil material compliance.

3.19 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers. These criteria may be revised by Geotechnical Engineering Firm based on conditions present and equipment being used.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.

2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.

3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.

D. Granular fills should be placed in layers not exceeding 12 inches thick. This criterion might be adjusted by the Geotechnical Engineer in the field depending on the conditions present at the time of construction, on the compaction equipment used and on the fill material selected. Fills for support of foundations/floor slabs and pavements should be compacted to at least 98 percent of the laboratory determined dry density, ASTM D 698, when small, hand operated compaction equipment is used and to at least 95 percent of the laboratory determined maximum dry density, ASTM D 1557, when self propelled, heavy duty compaction equipment is used. Fills placed in landscape areas should be compacted to 90 and 88 percent of the laboratory determined maximum dry density, ASTM D 698, and ASTM D 1557, respectively. Fills should extend a minimum of 5 feet beyond the exterior edge of a loaded area and have side slopes not steeper than two (2) horizontal to one(1)vertical. New fills should be benched into existing slopes a minimum of four (4) feet.

3.19 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

D. Seeded Areas: Cover areas designated to be seeded with a minimum of 6 inches of topsoil to finish grades indicated. If there is a deficiency of topsoil, provide clean topsoil from an outside source without additional cost to the owner.

3.20 SUBBASE AND BASE COURSES

A. Install separation fabric where indicated on drawings on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

B. Where indicated on drawings, under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.

2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3. Shape subbase and base to required crown elevations and cross-slope grades.

4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.

5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

3.21 DRAINAGE COURSE

A. Where indicated on drawings, place drainage course on prepared subgrade and as follows:

1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

2. When compacted thickness of drainage course is 6 inches (150 mm) or less, place materials in a single layer.

3. When compacted thickness of drainage course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

3.22 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering firm to perform field quality-control testing.

B. Allow engineering firm to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, testing frequency shall conform with that noted on contract drawings.

D. Geotechnical Fill will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

E. When Geotechnical engineering firm reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

F. If in opinion of Architect or cm, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, replace material and perform additional compaction until specified density is obtained.

3.23 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Unless otherwise approved, remove unsatisfactory soil, trash and debris and legally dispose of it off of Owner's property.

B. DO NOT remove topsoil from site.

C. If approved and directed by the Owner and architect and if the site permits: Transport surplus of satisfactory topsoil and soil to designated storage areas on Owners property. Stockpile soil as indicated on drawings or as directed by architect.

END OF SECTION 31 20 00