This project manual provides for liquidated damages in the amount of $500.00 per calendar day for the contractor's delay in completion of the work. See Bid Form, Agreement for Construction, Article 8 of the General Conditions for details.

PROJECT MANUAL

Harrisburg City Hall and Central Park Splash Pad
City of Harrisburg
Harrisburg, SD

CO-OP PROJECT NO. 2624

November 12, 2026

BID PACKAGE #1

CO Arch OP

LIQUIDATED DAMAGES

The anticipated construction schedule for **Bid Package #1** is as follows:

Commencement of Contract: On or near December 15, 2026
Commencement of Construction: March 15, 2027
Certificate of Substantial Completion: May 15, 2028
Final Completion: May 29, 2028

FOR EACH DAY PAST THE SUBSTANTIAL COMPLETION DATE, THE DELINQUENT PRIME CONTRACTOR SHALL PAY TO THE OWNER BY REASON OF FAILURE OF THE PRIME CONTRACTOR TO COMPLETE THE WORK REQUIRED OF HIM/HER WITHIN THE AGREED UPON PROGRESS SCHEDULE, A DAILY SUM BASED UPON THE FOLLOWING SCHEDULE:
General Contractor:

Bid Package #1: $500 per calendar day from May 15, 2028 thru SUBSTANTIAL COMPLETION.

THE AMOUNT ASSESSED HEREUNDER NEITHER SHALL BE IN LIEU OF, NOR SHALL AFFECT ANY OTHER REMEDIES AVAILABLE TO THE OWNER AS A RESULT OF THE FAILURE TO COMPLETE THE WORK WITHIN THE AGREED UPON PROGRESS SCHEDULE. TIME IS OF THE ESSENCE IN CONSTRUING THE TERMS OF THE CONTRACT AND A MATERIAL CONSIDERATION THEREOF. THE PARTIES AGREE THAT DAMAGES IN THE EVENT OF CONTRACTORS BREACH WOULD BE DIFFICULT TO CALCULATE, AND THAT THE FOREGOING IS A FAIR AND REASONABLE ESTIMATE OF THE DAMAGES SUFFERED BY THE OWNER IN THE EVENT OF SUCH BREACH.

THE TIME FOR COMPLETION OF ALL ARCHITECT/ENGINEER/OWNER PUNCHLIST ITEMS SHALL NOT BE LATER THAN:

14 calendar days beyond SUBSTANTIAL COMPLETION.

FOR EACH DAY PAST THE ABOVE DATE, THE DELINQUENT PRIME CONTRACTOR SHALL PAY TO THE OWNER THE FOLLOWING SUM:

$250 PER DAY

THE AMOUNT ASSESSED HEREUNDER NEITHER SHALL BE IN LIEU OF, NOR SHALL AFFECT ANY OTHER REMEDIES AVAILABLE TO THE OWNER AS A RESULT OF THE FAILURE TO COMPLETE THE WORK WITHIN THE AGREED UPON PROGRESS SCHEDULE. TIME IS OF THE ESSENCE IN CONSTRUING THE TERMS OF THE CONRACT AND A MATERIAL CONSIDERATION THEREOF. THE PARTIES AGREE THAT DAMAGES IN THE EVENT OF CONTRACTORS BREACH WOULD BE DIFFICULT TO CALCULATE, AND THAT THE FOREGOING IS FAIR AND REASONABLE ESTIMATE OF THE DAMAGES SUFFERED BY THE OWNER IN THE EVENT OF SUCH BREACH.

Harrisburg City Hall - Bid Package #1

City of Harrisburg

Harrisburg, SD

CO-OP Architecture Project No. 2624

November 12, 2026

Project Contacts:

Architect: CO-OP Architecture
Mr. Jason Kann, AIA
440 East 8th Street, Suite 221
Sioux Falls, SD 57103
Ph: 605-334-9999

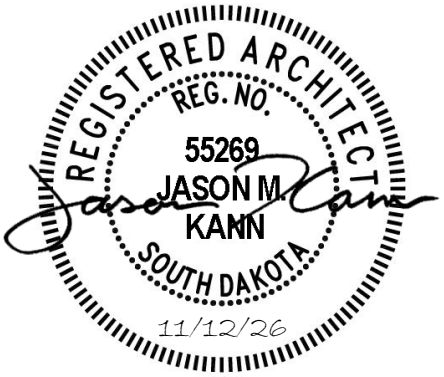
Civil Engineer: Stockwell Engineers, Inc.
Mr. Gaard Rops, P.E.
801 N. Phillips Avenue, Suite 100
Sioux Falls, SD 57104
Ph: 605-338-6668

Landscape Architect: Stockwell Engineers, Inc.
Mr. David Locke, P.L.A.
801 N. Phillips Avenue, Suite 100
Sioux Falls, SD 57104
Ph: 605-338-6668

Structural Engineer: Heyer Engineering
Mr. Britt Haroldson, P.E.
436 East 8th Street
Sioux Falls, SD 57103
Ph: 605-705-4600

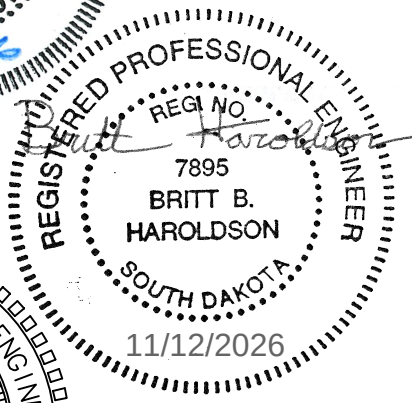
Mechanical Engineer: Associated Consulting Engineering, Inc.
Mr. Tom deWit, P.E.
340 South Phillips Avenue
Sioux Falls, SD 57104
Ph: 605-335-3720

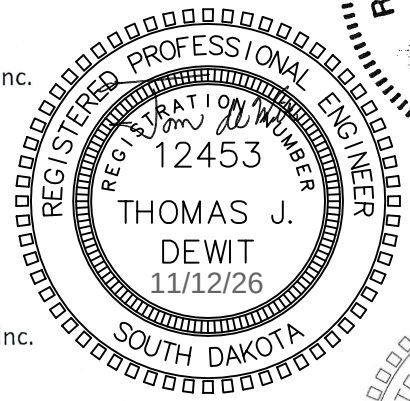
Electrical Engineer: Associated Consulting Engineering, Inc.
Mr. Jeff Renken P.E.
340 South Phillips Avenue
Sioux Falls, SD 57104
Ph: 605-335-3720











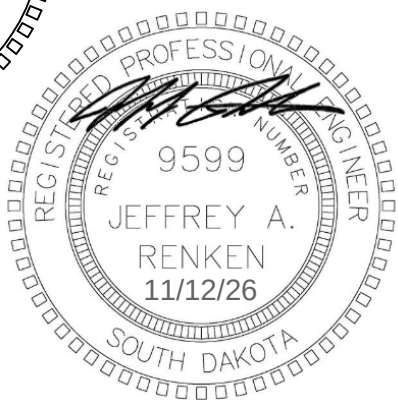


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014000 QUALITY REQUIREMENTS
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015000 TEMPORARY FACILITIES AND CONTROLS
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DIVISION 03 - CONCRETE

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031000 CONCRETE FORMING AND ACCESSORIES
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047200 CAST STONE MASONRY

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262890 SURGE PROTECTION DEVICES
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312323 FILL

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G000	**CODE STANDARDS AND SYMBOLS LEGEND**
G001	**GENERAL NOTES, CODE & ORIENTATION PLAN**
CIVIL	
C100	**GENERAL NOTES**
C101	**GENERAL NOTES**
C102	**GENERAL NOTES**
C103	**GENERAL NOTES**
C104	**GENERAL NOTES**
C105	**GENERAL NOTES**
C106	**GENERAL NOTES**
C107	**GENERAL NOTES**
C108	**GENERAL NOTES**
C109	**GENERAL NOTES**
C110	**GENERAL NOTES**
C111	**GENERAL NOTES**
C112	**GENERAL NOTES**
C113	**GENERAL NOTES**
C114	**GENERAL NOTES**
C115	**GENERAL NOTES**
C200	**TRAFFIC CONTROL**
C300	**SWPPP**
C301	**SWPPP**
C302	**SWPPP**
C310	**EROSION CONTROL PLAN**
C320	**EROSION CONTROL DETAILS**
C400	**EXISTING CONDITIONS & REMOVALS**
C500	**UTILITIES PLAN**
C600	**PAVEMENT PLAN**
C610	**SIGNAGE & STRIPING PLAN**
C700	**GRADING PLAN**
C800	**DETAILS**
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C802 DETAILS

C803 DETAILS

C804 DETAILS

C805 DETAILS

C806 DETAILS

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L200 IRRIGATION PLAN

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A105 ROOF PLAN

A110 REFLECTED CEILING PLANS

A120 FINISH PLANS

A130 FINISH SCHEDULE & LEGENDS

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A201 EXTERIOR ELEVATIONS

A300 BUILDING SECTIONS

A301 BUILDING SECTIONS

A310 WALL SECTIONS

A311 WALL SECTIONS

A312 WALL SECTIONS

A400 3D VIEWS

A410 ENLARGED PLANS & INTERIOR ELEVATIONS

A411 ENLARGED PLANS & INTERIOR ELEVATIONS

A412 ENLARGED PLANS & INTERIOR ELEVATIONS

A500 EXTERIOR DETAILS

A501 EXTERIOR DETAILS

A502 EXTERIOR DETAILS

A503 EXTERIOR DETAILS

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A601 EXTERIOR DOOR & WINDOW DETAILS
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A603 EXTERIOR DOOR & WINDOW DETAILS
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S202 ROOF PLAN - BEAM REACTIONS
S301 FOUNDATION DETAILS
S302 FOUNDATION DETAILS
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S402 FRAMING DETAILS
S403 FRAMING DETAILS
S404 FRAMING DETAILS

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M101 DETAILS
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M300 FIRST LEVEL - VENTILATION & A/C
M400 SCHEDULES
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M501 FIRST LEVEL - FIRE PROTECTION

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E301 ELECTRICAL SCHEDULES
E302 ELECTRICAL SCHEDULES
E303 ELECTRICAL DETAILS

NOTICE TO BIDDERS

Sealed bids will be received by the City of Harrisburg of Lincoln County, South Dakota for the proposed construction related to the **Harrisburg City Hall and Central Park Splash Pad** until **2:30 p.m., local time on Tuesday, December 8, 2026.** The bids are due at the Harrisburg City Hall, 301 E Willow Street, Harrisburg, South Dakota. The bid opening will be held at the Heritage Board Room, 200 E Willow Street, Harrisburg, South Dakota. A pre-bid meeting will be held at City Hall at 2:30 p.m., local time on Tuesday, December 1st, 2026, with a tour of the site to follow.

The Issuing Office for the Bidding Documents is Stockwell Engineers located at 801 North Phillips Ave, Suite 100, Sioux Falls, SD 57104, (605) 338-6668. Prospective bidders may download and examine complete electronic bidding documents at no charge at the designated website, www.stockwellengineers.com. Copies of the Plans and Specifications will be made available electronically (pdf format). Technical questions for the City Hall project shall be directed to Guillermo Cebrian, Sioux Falls, South Dakota at 605-271-0636, or guillermo@co-oparch.com. Technical questions for the Splash Pad project shall be directed to Stockwell Engineers, Sioux Falls, South Dakota at 605-338-6668, or dlocke@stockwellengineers.com.

Prospective Bidders are urged to register with the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

Bidding documents may also be examined at the following locations:

Sioux Falls Builders Exchange, Sioux Falls, SD
Plains Builders Exchange, Sioux Falls, SD
Aberdeen Builders Exchange, Aberdeen, SD
Fargo-Moorhead Builders Exchange, Fargo, ND
Minneapolis Builders Exchange, Minneapolis, MN

Bids shall be submitted to the City of Harrisburg in a sealed envelope with the name and address of the bidder clearly identified on the envelope and the words "Bid for Harrisburg City Hall and Central Park Splash Pad". All bidders shall take note of the AIA Document A701 "Instructions to Bidders", and the AIA Document A201 "General Conditions of the Contract for Construction". Faxed bids will not be accepted; nor will faxed bid adjustments be accepted. The Owner will accept single bids for Bid Package #1, Bid Package #2, or a combination of both as Bid Package #3. Award will be based on the lowest sum of each, with Alternates being accepted at the Owner's discretion.

No bidder may withdraw a bid for 30 days following the bid opening without a written request explaining the cause of the withdrawal and without written consent of the Owner after reviewing the cause.

Liquidated damages shall be in effect for this project. See Bid Form, Agreement for Construction, and the General Conditions for details.

Each bid shall be accompanied by a certified check, a cashier's check or draft certified or issued by a state or national bank, in the amount of at least five percent (5%) of the total amount of the bid, payable to City of Harrisburg; or in lieu thereof, bidder may furnish a bid bond in the amount of not less than ten percent (10%) of the amount of the bid, such bond to be issued by a surety authorized to do business in the State of South Dakota and payable to City of Harrisburg as a guarantee that such bidder will enter into a contract with the Owner for the work described in the bid and as specified.

The City of Harrisburg reserves the right to reject any part of, or all bids, and to waive any informalities or irregularities therein.

By virtue of statutory authority preference will be given to contracts, labor, materials, products, and supplies found or produced within the State of South Dakota in a manner provided by law.

CITY OF HARRISBURG
of Lincoln County, South Dakota

By: Rich Kluin, CFO

Publish: Thursday, November 12th, 2026
Thursday, November 19th, 2026

BID FORM
BID PACKAGE #1 – HARRISBURG CITY HALL

PROJECT: Harrisburg City Hall and Central Park Splash Pad
City of Harrisburg

TO: City of Harrisburg
301 E. Willow St.
Harrisburg, South Dakota 57032

BID OF: _____
(hereinafter called "Bidder")

The Bidder, in compliance with your Advertisement for Bids for the Complete Construction for the proposed building, having examined the drawings and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents· of which this Bid is a part. Bidder hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the Owner, and to fully complete the project at the dates set forth in the Contract Documents.

BIDDER AGREES TO PERFORM THE COMPLETE CONSTRUCTION for the following sum:

For the following Base Bid:

Bid Package #1 – Harrisburg City Hall

_____($_____)

Alternate #1A – Site Furnishings (Add or Deduct):

_____($_____)

Alternate #1B – Z Furring (Add or Deduct):

_____($_____)

Alternate #1C – Site Lighting (Add or Deduct):

_____($_____)

Alternate #1D – Acoustic Wall Panels (Add or Deduct):

_____($_____)

Alternate #1E – Spray Foam Insulation (Add or Deduct):

_____($_____)

Alternate #1F – Reception Desk (Add or Deduct):

_____($_____)

UNIT PRICES:

Item A – Over Excavation of Unsuitable Material $_____ Per CuYd

Item B – Imported and Compacted Fill $_____ Per CuYd

MAJOR SUBCONTRACTORS:

Plumbing _____

HVAC _____

Electrical _____

ADDENDA:

The undersigned acknowledge receipt of addenda as noted and the bid submitted herewith is in accordance with the stipulations set forth herein.

ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____

The undersigned agrees that his bid may not be withdrawn for a period of 30 days from the time set for opening of bids and that if notified of acceptance of his Proposal within the stated time, or at any time thereafter before the bid is withdrawn, he will within ten (10) days of such notification, execute and deliver a Contract in the Form of Contract specified.

The Contractor shall commence work under this Contract within ten (10) calendar days after the date of receipt by him of Notice to Proceed, to prosecute said work diligently, and to complete the entire project ready for use at the dates set forth in the Contract Documents. The time stated for completion shall include a time allowance for inspections, completion of items requiring further attention and a final cleanup of premises.

The above bid includes State and Local Sales Tax on materials and all other State and Federal Taxes that would affect the amount of the bid.

In submitting this bid it is understood that the right is reserved by the Architect and Owners to reject any and all bids and to waive all informalities.

BIDDER: _____

BY: _____

TITLE: _____

BUSINESS
ADDRESS: _____

STATE OF
INCORPORATION: _____
(SEAL)

BID FORM
BID PACKAGE #3 – HARRISBURG CITY HALL AND CENTRAL PARK SPLASH PAD

PROJECT: Harrisburg City Hall and Central Park Splash Pad
City of Harrisburg

TO: City of Harrisburg
301 E. Willow St.
Harrisburg, South Dakota 57032

BID OF: _____
(hereinafter called "Bidder")

The Bidder, in compliance with your Advertisement for Bids for the Complete Construction for the proposed building and splash pad project, having examined the drawings and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents· of which this Bid is a part. Bidder hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the Owner, and to fully complete the project at the dates set forth in the Contract Documents.

BIDDER AGREES TO PERFORM THE COMPLETE CONSTRUCTION for the following sum:

For the following Base Bid:

Bid Package #3 – Harrisburg City Hall (Bid Package #1) and Central Park Splash Pad (Bid Package #2) Combined

_____($_____)

Alternate #1A – Site Furnishings (Add or Deduct):

_____($_____)

Alternate #1B – Z Furring (Add or Deduct):

_____($_____)

Alternate #1C – Site Lighting (Add or Deduct):

_____($_____)

Alternate #1D – Acoustic Wall Panels (Add or Deduct):

_____($_____)

Alternate #1E – Spray Foam Insulation (Add or Deduct):

_____($_____)

Alternate #1F – Reception Desk (Add or Deduct):

_____($_____)

Alternate #2A – Lifefloor Surfacing (Add or Deduct):

_____($_____)

Alternate #2B – Northeast Parking Lot (Add or Deduct):

_____($_____)

Alternate #2C – Site Furnishings (Add or Deduct):

_____($_____)

UNIT PRICES – BID PACKAGE 3:

Item A – Over Excavation of Unsuitable Material $_____ Per CuYd

Item B – Imported and Compacted Fill $_____ Per CuYd

MAJOR SUBCONTRACTORS:

Plumbing _____

HVAC _____

Electrical _____

Splash Pad Equipment Installer _____

ADDENDA:

The undersigned acknowledge receipt of addenda as noted and the bid submitted herewith is in accordance with the stipulations set forth herein.

ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____
ADDENDUM NO_____ DATED _____

The undersigned agrees that his bid may not be withdrawn for a period of 30 days from the time set for opening of bids and that if notified of acceptance of his Proposal within the stated time, or at any time thereafter before the bid is withdrawn, he will within ten (10) days of such notification, execute and deliver a Contract in the Form of Contract specified.

The Contractor shall commence work under this Contract within ten (10) calendar days after the date of receipt by him of Notice to Proceed, to prosecute said work diligently, and to complete the entire project ready for use at the dates set forth in the Contract Documents. The time stated for completion shall include a time allowance for inspections, completion of items requiring further attention and a final cleanup of premises.

The above bid includes State and Local Sales Tax on materials and all other State and Federal Taxes that would affect the amount of the bid.

In submitting this bid it is understood that the right is reserved by the Architect and Owners to reject any and all bids and to waive all informalities.

BIDDER: _____

BY: _____

TITLE: _____

BUSINESS
ADDRESS: _____

STATE OF
INCORPORATION: _____
(SEAL)

AIA® Document A701® – 2018

Instructions to Bidders

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

Harrisburg City Hall and Central Park Splash Pad
Located within the City-owned Central Park
Harrisburg, SD 57032

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

City of Harrisburg
301 East Willow St.
Harrisburg, SD 57032

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

Collaborative Operandi Architecture, LLC
D.B.A. CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, SD 57103

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1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 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.

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User Notes: (69b1ba29657ddd6edd7:

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

Bidding documents will be distributed via email.

§ 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

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

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

Clarifications, interpretations, and substitution requests shall be made via email.

§ 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.

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§ 3.4 Addenda

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

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

Addenda will be issued to planholders via email.

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

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

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

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

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

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

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

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

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

§ 4.2 Bid Security

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

(Insert the form and amount of bid security.)

See Notice to Bidders.

§ 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

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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, beginning30 days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

By paper copy via mail or in person.,

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

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

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

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

§ 4.4 Modification or Withdrawal of Bid

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

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

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

Bid security will be returned.

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.

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§ 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

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shall be added to the Bid in determining the Contract Sum.

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

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

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

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

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

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

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

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.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, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

Number	Title	Date

.6 Specifications

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Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

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Supplements to Instructions to Bidders

AIA Document A-701 "Instructions to Bidders" latest Edition shall pertain to this contract. The following information and supplements shall modify, change, delete or add to this document. Where any part of the Instructions to Bidders is modified or voided by the following articles, the unaltered provisions of that part shall remain in effect.

3.1.1 Copies of the Plans and Specifications will be made available electronically (pdf format). Technical questions shall be directed to CO-OP Architecture, LLC, Sioux Falls, South Dakota at 605-334-9999.

4.1.1.1 Bids will be received for one prime contract for the Harrisburg City Hall (Bid Package #1), one prime contract for Central Park Splash Pad (Bid Package #2), and one prime contract for both (Bid Package #3). Bids for each package shall be placed in separate envelopes, with a bid bond and bid form for each.

4.2.1 Bid Security will be required on this project as specified in Advertisement for Bids.

4.3.1. Bids shall be submitted in sealed envelope plainly marked on face as follows:

Bidders Name

Bidders Address

Proposal For: General Construction (Bid Package #1, 2, or 3)

Project: Harrisburg City Hall & Central Park Splash Pad

Location: Harrisburg, South Dakota

4.3.2. Bids will be received as follows:

Date: **December 8, 2026**

Time: **2:30 p.m.**

Location:

Harrisburg City Hall

301 East Willow Street

Harrisburg, South Dakota 57032

4.4.1. Bids may not be modified, withdrawn or cancelled for thirty (30) days following date for receipt of bids.

5.1. Bids will be publicly opened and read aloud.

6.1. Contractors Qualification Statement, AIA Document A305 will not be required prior to bidding but may be required prior to award of contract. If same is requested, it shall be submitted within ten days from date of request.

6.3.1. Forms for submittals of items 6.3.1.1., 6.3.1.2. and 6.3.1.3 will be supplied by the architect. Forms to be submitted in two copies.

7.1.1. Performance Bond and Payment Bond will be required of successful prime contractor and cost of same to be included in the bid. Bond shall be executed on AIA Standard Form A312, with amount shown on each part equal to 100 percent of the total amount payable by terms of the contract. Surety shall be company licensed to do business in South Dakota and acceptable to architect and owner. Two copies of each are required. Bonds to be issued to owner, same as Bid Security listed in Advertisement for Bids.

8.1. A copy of this agreement may be examined by bidders at the office of the architect.

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Harrisburg City Hall and Central Park Splash Pad
Located within the City-owned Central Park
Harrisburg, SD 57032

THE OWNER:
(Name, legal status and address)

City of Harrisburg
301 East Willow Street
Harrisburg, SD 57032

THE ARCHITECT:
(Name, legal status and address)

Collaborative Operandi Architecture, LLC
D.B.A. CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, SD 57103

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ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 to or deleted from the original AIA text.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™–2017, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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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 written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 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 written protocols

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governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

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Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

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§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for

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construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not

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be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

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§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

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§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

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

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

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in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

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reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

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§ 9.5 Decisions to Withhold Certification

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

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

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

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§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

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§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

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ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

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§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

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Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

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§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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

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

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

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

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

§ 13.5 Interest

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

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

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

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly

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waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after

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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

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information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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§ 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.

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SUPPLEMENTS TO GENERAL CONDITIONS

AIA Document A-201-2017 “General Conditions of the Contract for Construction”, shall pertain to this contract. The following information and supplements shall modify, change, delete or add to this document. Where any part of the General Conditions is modified or voided by the following articles, the unaltered provisions of that part shall remain in effect.

Article 3 – Contractor:

Add the following:

3.10.4. Progress Schedule shall be submitted by general contractor in six copies within ten days after date of Notice to Proceed. Architect will distribute to each other prime contractor and owner.

3.12.5.1 Procedures for shop drawing submittals will be as follows:

1. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

3.12.9.1 Each room, door, window and other items having numbers on the contract drawings shall be referred to by those numbers only and are not to be changed on shop drawings.

3.15.3 All glass shall be fully protected from damage of any kind. Do not allow mortar or any other substance to remain on glass. Just prior to final inspection, the general contractor shall replace any broken glass; clean all glass; remove stains, spots, marks or other dirt from his work; clean all walks and drives by washing and/or sweeping; remove all construction equipment and excess materials from site; clean hardware; remove all paint spots; clean all walls if necessary and clean all floors in accordance with the instructions of flooring sub-contractor.

Article 7 – Changes in the Work

Add the following:

7.2.1.4. Change orders will be prepared in three copies. Likewise, change order proposals shall be prepared in three copies and shall contain a complete breakdown of all costs and substantiating proposals from subcontractors if involved, shall be attached, Subcontractor proposals also to contain a complete breakdown.

7.2.1.5. Maximum allowance for overhead and profit on add or deduct change orders shall be 5% for overhead and 5% for profit. The cost of the Bond, Builders Risk, basic construction plant, home office, general superintendent and the like, shall be considered part of the overhead cost. Add or deduct control orders will be computed on the same basis. For change orders of work where the prime contractor (Architectural Trades, Mechanical or Electrical) has awarded the work to a subcontractor, the prime contractor shall be allowed one fee only in an amount not to exceed 10% on add or deduct change orders.

Article 9 – Progress Payments:

9.6.1. Add the following:

Progress payment retainage: The contract shall be so conditioned that it will provide for retention of not less than the following percentages:

5% of the amount of the contract until the contract shall be fully executed and completed to the satisfaction and acceptance of the owner.

9.10.2. The requirements of this paragraph must be met prior to issuance of final certificate for payment. The contractor will submit AIA Documents G706, G706A, and G707 to architect to meet compliance.

Article 10 – Protection of Persons and Property:

Add the following:

10.2.7. All parts of the work shall be braced to resist wind or other loads. The contractor shall perform the work with the explicit understanding that the design of the project is based on all parts of the work having been completed and as such, the methods of performance of each part of the work shall be done accordingly.

10.2.8. Temporary items such as, but not limited to:

Scaffolding, staging, lifting, and hoisting devices, shoring, excavation, barricades, and safety and construction procedures necessary in completion of the project shall be the responsibility of the contractors and their subcontractors and shall comply with the applicable codes and regulations. OSHA Standards for the Construction Industry (29DFR Part 1926) shall be complied with in every respect. It shall not be the responsibility of the owner or the architect to determine if the contractors, subcontractors, their representatives are in compliance with the aforementioned regulations.

Article 11 – Insurance and Bonds

11.1 Contractor's Insurance and Bonds

Add the following clauses to 11.1.1:

11.1.1.1 In addition to the Owner, Architect, and Architect's consultants, Stockwell Engineers shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the contract Documents.

11.1.1.2 The Insurer shall have an A.M. Best rating of "A" or better.

11.1.1.3 Liability Insurance shall include all major division of coverage and be on comprehensive basis including:

1. Premises Operations (including X, C and U coverages as applicable).
2. Independent Contractor's Protective.
3. Personal Injury Liability with Employment Exclusion deleted.
4. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
5. Broad Form Property Damage including Completed Operations.

11.1.1.4 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

11.1.1.5 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Workers Compensation:
    a. State: South Dakota Statutory
    b. Applicable Federal (e.g. Longshoremen's): Statutory
    c. Employer's Liability:

        $100,000 per Accident
        $500,000 Disease, Policy Limit
        $100,000 Disease, Each Employee

2. Commercial General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Broad Form Property Damage Contractual, Personal Injury):

    a. $1,000,000 Each Occurrence

    b. Owner shall be included as an Additional Insured on the Contractor's General Liability coverage on a Primary Non Contribution basis including completed operations.

    c. General Aggregate; $2,000,000

    d. Products and Completed Operations to be maintained for two years after final payment.

    e. Property Damage Liability Insurance shall provide X,C, and U coverage. Any exception to the above must be noted on Certificate.

    f. Broad Form Property Damage Coverage shall include Completed Operations.

    g. Personal Injury and Advertising, with Employment Exclusion deleted:

        $1,000,000.

    h. If the General Liability coverages are provided by a Commercial Liability policy, the:

        General and Products and Completed Operations aggregate shall not to be less than $1,000,000 and it shall apply, in total, to this project only. If, under terms of a Commercial General Liability or for products and completed operations aggregate policy or Commercial Umbrella Liability

policy or the general aggregate amount specified for this project only, is reduced up to 10% by the total of all claims, paid and pending, for which the Contractor is or may be liable, the Contractor shall notify the Owner within 10 days of such reduction or potential reduction. Contract shall indicate in the notification separate totals for each category, paid and pending. If instructed by the Owner in writing, the Contractor shall, at its own expense, restore the general aggregate to their original amounts. Contractor shall, within 30 days receipt of such notice, submit a revised Certificate of Insurance indicating restoration of required general aggregates. The Contractor may, on its own, restore the general aggregate to the original amounts for this project only at any time during the progress of the work without relying on notification by Owner.

i. Fire Damage Limit shall be not less than $50,000 on any one fire.

j. Medical Expense Limit shall be not less than $5,000 on any one person.

3. Business Auto Liability (including owned, non-owned and hired vehicles):

    a. Bodily Injury:

        $500,000 Each Person OR for 3a), b) $1,000,000 CSL
        $1,000,000 Each Occurrence

    b. Property Damage:

        $500,000 Each Occurrence

4. Umbrella Excess Liability:

    $1,000,000 Each Occurrence
    $1,000,000 General Aggregate
    $1,000,000 Products & Completed Operations Aggregate
    $1,000,000 Retention for self-insured hazards each occurrence.

Aaron Swan
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CO-OP Architects
440 East 8th Street, #221
Sioux Falls, SD 57103

September 18, 2026

Subj: Report of Geotechnical Exploration
Proposed City Hall Building
Harrisburg, SD

ASA. No. 26G-061

We have completed the geotechnical exploration for the proposed City Hall building to be constructed in Harrisburg, South Dakota. Our project study results are attached. Please read the entire report for details of our conclusions and recommendations. A general summary of our findings is as follows:

- **Foundations:** Standard spread type footings should be supported on a minimum of 2 feet of an engineered fill material. The geotechnical representative can evaluate the soils and perform the necessary testing to ensure proper bearing capacity.
- **Soil Bearing Capacity** Maximum 2,000 psf.
- **Floor Slabs** We recommend all floor slabs also be supported by at least 2 feet of engineered fill soils. The top portion of the fill should consist of a minimum of 6-inches of a clean, free draining granular material/leveling course. The exposed soils should be inspected and tested prior to the placement of new fill material. The geotechnical representative can evaluate the soils for proper compaction. Some additional excavation may be required if soft pockets or otherwise unsuitable materials are encountered.
- **Engineered Fill** -Granular engineered fill should consist of a crushed aggregate base course material or a pit run non-expansive, low frost susceptible material with a maximum aggregate size of 2-inches, 40 to 85% passing the No. 4 sieve, and no more than 15% passing the No. 200 sieve with a Liquid Limit less than 25.

-The 6-inches of clean granular fill material recommended directly beneath floor slabs should have a nominal size of 1-inch, less than 7% by weight passing the #200 sieve, and less than 40% passing the #40 sieve.

o **Compaction Requirements (% of Standard Proctor)**	-Footing Areas:	95%
	-Interior Slab Areas:	95%
	-Exterior Slab Areas:	95%
	-Interior Backfill:	95%
	-Exterior Backfill*:	90%

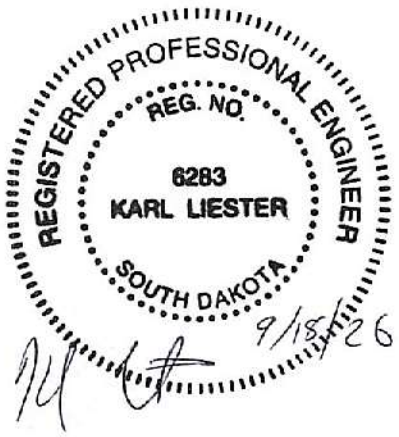
*Any backfill supporting pavement, sidewalks or other structural elements should be compacted to at least 95% of Standard Proctor (ASTM: D698).

We appreciate the opportunity to have provided the geotechnical engineering for this project. We are available for consultation during the various design stages. In order to provide complete professional services, we should perform construction observation and testing.

If you have any questions about this report, or require additional consultation, design, observation, or testing services, please contact us.

Sincerely,
AARON SWAN AND ASSOCIATES, INC.

Karl Liester, PE
Lead Geotechnical Engineer



INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed City Hall building to be constructed in Harrisburg, South Dakota.

Our services included obtaining information on site conditions, performing field and laboratory testing, performing engineering analyses, providing recommendations for use in foundation and floor slab design and presenting earthwork guidelines. Results of the field explorations, field tests and laboratory tests are presented in the Appendix.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, expressed or implied, is made. We prepared the report as an aid in the design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific techniques to be used on this project.

PROJECT INFORMATION

Based upon the information and plans provided to us, we understand the project will consist of the construction of the new Harrisburg City Hall to be located at 150 Columbia Street North in Harrisburg, South Dakota. We understand the proposed construction will consist of a new single-story, slab on grade building with associated utilities, paved access drives and parking areas. We assume the building will be founded on conventional frost depth concrete spread footings with slab-on-grade floors. We estimate the main level of the building will be constructed 1 to 2 feet above the existing site grade. Parking and drive areas are also expected to require minimum cuts and fills.

SUBSURFACE EXPLORATION AND TESTING PROGRAMS

A total of (8) standard penetration test (SPT) borings were performed: (4) to approximately 15 feet below existing grade within the area of the proposed building, and (4) to 5 feet within the areas of the proposed parking lot and access drives. The borings were performed at the approximate locations indicated on the attached site plan. Logs of the subsurface borings are also presented in the Appendix. The boring locations were approximately determined based upon the site plans provided to us.

The Unified Soil Classification System was used to classify the site soils. The soil classification symbols appear on the attached subsurface boring logs and are briefly described in the Appendix.

Laboratory analyses were performed on representative soil samples to aid in material

classification and to estimate pertinent engineering properties of the on-site soils. Testing was performed in general accordance with applicable ASTM specifications. The test results are presented on the attached subsurface boring logs, adjacent to the corresponding samples on which they were performed.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. All conditions noted are strictly for the information of our client.

SITE CONDITIONS

Surface Observations

At the time of our site work, the lot and area of the proposed construction consisted mostly of 2 softball fields. The ground surface within the area of the proposed building was covered with grass and the aggregate softball infield.

Subsurface Soils/Geology

The subsurface conditions encountered at each test boring location are illustrated on the subsurface boring logs included in the Appendix. We wish to point out that the subsurface conditions at other times and locations on this site may differ from those found at our test locations. If different subsurface conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

At the time of our field work, groundwater was not encountered in any of the borings. The lack of groundwater noted at the boring locations should not be taken as an accurate representation of the actual groundwater levels. Fluctuations in the groundwater table may occur for various reasons, e.g. variations in precipitation, evaporation, surface runoff, groundwater withdrawal and recharge. A more accurate evaluation of the water table would require installing and monitoring piezometers over an extended time period; this period of time is generally not available during a typical subsurface exploration program.

CONCLUSIONS AND RECOMMENDATIONS

General

Our recommendations are based on the assumption that the soil conditions are similar to those encountered within our soil borings. If variations are noted during construction or if changes are made to the site plan, structural loading, foundation type or floor level, we should be notified so we can supplement our recommendations, as applicable.

The soil borings encountered natural lean clay soils throughout the depth of the borings with approximately 6 inches of topsoil at the surface. Laboratory tests indicate the lean clay soils have a moderate potential for expansion and therefore, we recommend a minimum of 2 feet of granular engineered fill be placed below the footings and floor slabs.

Foundations

Standard Spread Footings

It is our opinion that the building can be supported by a conventional frost depth spread footing foundation system. Footings are anticipated to bear approximately 3 to 4 feet below the existing grades depending on the final floor slab elevation.

If the recommendations contained in this report are followed, the proposed building/foundation system can be supported on 2 feet of an engineered fill material placed from the natural lean clay soil. An engineering evaluation following completion of the excavation should be performed to determine if any other low density or otherwise unsuitable areas are present prior to placement of the foundations.

Areas of low density or otherwise unsuitable soils may require additional compaction or over excavation and placement of engineered fill. All necessary fill soils placed should be tested to ensure that a minimum compaction of 95% of the Standard Proctor value is attained.

Footings should be placed a minimum of 48-inches below finished grade for frost protection in a heated structure, or should be properly insulated to prevent frost intrusion below the footings. Footings should be similarly insulated or placed a minimum of 60-inches below finished grade for frost protection in a non-heated structure. The maximum bearing capacity for these soils should not exceed 2000 psf. Further recommendations for site preparation are presented in the "Earthwork" section.

The movement of the proposed structure, supported as recommended, should be within allowable limits for this type of structure (less than 1 inch/100 ft total and ½" differential). Additional foundation movements could occur if water from any source infiltrates the foundation soils. Proper drainage should be provided in the final design, during construction and maintained throughout the life of the structure.

Therefore, we also recommend an exterior foundation drain be installed to intercept potential water infiltration. The perforated PVC perimeter drain pipe, typically 4-inches in diameter with a filter sock, should be placed at the outside bottom edge of the foundation excavation for the entire structure. Additionally, the pipe should be embedded in free

draining gravel. For proper drainage, the pipe should be graded at a minimum of 0.5 percent slope and connected to a collection pipe that discharges to a sump and pump system, storm sewer, or to a daylight point beyond the footprint of the structure.

Interior Slab-on-Grade Floors

We recommend interior floor slabs be supported by a minimum of 6-inches of a clean granular fill material/leveling course overlying at least 1.5 feet of a granular engineered fill material. Prior to placement of the recommended leveling course, the exposed subgrade soils should be evaluated for proper compaction and bearing capacity. The geotechnical representative will be able to provide additional recommendations based on the conditions encountered at the time of excavation. Areas of low density or otherwise unsuitable soils may be required to be recompacted or over-excavated for additional engineered fill placement.

The recommended minimum of 6-inches of fill/leveling course placed directly beneath the floor slab areas should consist of a relatively free-draining granular soil having a maximum size of 1-inch with less than 7% fine material passing the #200 sieve by weight, and less than 40% passing the #40 sieve. The purpose of this sand cushion/leveling course is to provide a working surface for the placement of concrete and also to serve as a capillary barrier. The slab subgrade should be prepared by the procedures outlined in this report.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or excessive slump (water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

Exterior Slabs-on-Grade

Exterior slabs-on-grade, exterior architectural features, and utilities may experience some movement due to the frost susceptibility of the soils on site. Reduction of potential movement and/or the resulting cracking could be realized by:

1. Minimizing moisture increases in the soil. Slopes should be implemented to drain surface water away from any proposed exterior slabs on grade.

2. Moisture-density control during placement of all soils and the use of a granular fill material beneath exterior slabs on grade.

3. Use of designs which allow vertical movement between the exterior features

and adjoining structural elements.

4. Placement of effective control joints on relatively close centers.

5. Allowance for vertical movements in utility connections.

Pavement Recommendations

Subgrade Preparation

Prior to placement of base course/new pavement or any fill to obtain final subgrade elevations, remove all topsoil from the paved areas. The exposed subgrade soils should be proof-rolled to verify a firm and unyielding subgrade has been obtained prior to the placement of new fill and/or base course materials.

Based upon the range of moisture contents measured within the borings, the subgrade soils will likely be near or below optimum moisture content. To obtain a firm and unyielding subgrade on which to construct the new pavement sections, moisture conditioning of the subgrade soils should be anticipated. The earthwork contractor should be made aware of the soil conditions at the site and account for the anticipated subgrade preparation work.

Contrarily, should weather related or seasonal increases to moisture content of the subgrade soils be encountered at the time of construction, scarification and drying of the subgrade soils may be required to obtain a firm and unyielding subgrade on which to construct the new pavement sections. This scarification process may need to be repeated over several days in order to allow the soils to dry back to an acceptable moisture content.

If project schedules do not allow for sufficient time to dry the soil back to acceptable levels, use of a geo-textile stabilization/separation material can be incorporated in the design. The geo-textile should be placed on top of the graded subgrade and below the aggregate base course layer. Any areas that "pump" under the loaded dump truck should be evaluated by the engineer to determine whether additional excavation and replacement with a coarse, clean rock (4 to 6-inch oversized “shot rock” material) or the use of a geo-textile fabric should be used to stabilize the subgrade. Once the subgrade has been proof-rolled and approved by the geotechnical engineer, base course may be placed.

If additional fill is required, the proposed imported backfill should be submitted to the geotechnical engineer for approval prior to use.

Aggregate Base Course

Aggregate base course should be moisture conditioned to within ±3% of optimum and

compacted to a minimum of 95% of maximum density as determined by the Standard Proctor method (ASTM: D698) and should meet the requirements as outlined by the South Dakota Department of Transportation (SD DOT). If a geotextile separation/stabilization fabric is used, we recommend you contact the manufacturer for design parameters and additional considerations for the pavement section.

Asphalt or PCC Pavement Recommendations

Based on the previously described design parameters and our analysis, we recommend the following minimum pavement sections be used for this project:

Traffic Area	Flexible (Asphalt), in.	Rigid (Concrete), in	Aggregate Base Course, in.	Total, in.
Access Drives/Parking Areas	4	--	8	12
	--	6	8	14
Loading Zones/Dumpster Pads/Entry Aprons	6	--	8	14
	--	7	8	15

We recommend the asphalt be obtained from an approved mix design conforming to the South Dakota Department of Transportation (SDDOT) Class E Specifications as defined in the “Standard Specifications for Road and Bridges”, current edition. Where rigid pavements are used, the concrete should be obtained from an approved mix design conforming to Section 380 “Portland Cement Concrete Pavement” and Section 460 “Structural Concrete” of the SDDOT Specifications, current edition.

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of joints should be based upon the final pavement geometry. Sawed joints should be cut within 24-hours of concrete placement. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Aggregate used in the asphalt and concrete should meet SDDOT specifications under Section 880 “Aggregates for Asphalt Concrete” for quality and gradation. Mix designs should be submitted prior to construction to verify their adequacy.

Utility Trench Construction

We recommend that all utility lines be placed as noted herein and in accordance with any City of Harrisburg earthwork and utility construction documents, if applicable. Conventional construction equipment such as tracked excavators should be able to make the required trench excavations along the utility alignments. If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce side slope erosion or running which could require slope maintenance.

For trench excavations, we recommend the site lean clay soils be considered Type B soils when applying the OSHA regulations. OSHA recommends a maximum slope inclination of 1H:1V (horizontal/vertical) for Type B soils. These classifications should be considered preliminary and should be verified in the field on a daily basis by the contractor and/or geotechnical engineer. Excavations deeper than 20 feet and/or in saturated soils or below the groundwater table should be considered on an individual basis. Water levels, due to climatic conditions, should be evaluated at the time of construction. If the above trench layback recommendations are not feasible, due to space limitations or other factors, the OSHA rules should be consulted for alternative trench stabilization methods. Trench boxes or shoring in compliance with OSHA rules may be acceptable alternatives.

Based on the range of current moisture contents determined in our laboratory, the excavated soils will require processing and moisture conditioning to bring the trench spoils close to the optimum moisture content before reuse as trench backfill. We recommend the moisture content of the upper site lean clay/silt soils used as backfill be adjusted to within -1 to +3% of the optimum moisture content (ASTM: D698). Granular (silty sand) soils should be adjusted to within ±3% of the optimum moisture content.

Please note that means and methods of attaining the required moisture content and workability of the material should be left to the discretion of the earthwork contractor, but high moisture content site soils should not be deemed 'unsuitable' for use. Earthwork contractors should bid this project accordingly. We also recommend particular attention be paid to the compaction efforts around manholes to reduce the potential of future related settlements issues.

The trench backfill should be placed in 8-inch maximum loose lift thicknesses and compacted to at least 95% of maximum Standard Proctor (ASTM: D698) dry density. Additionally, we recommend the top 1-foot of the trench backfill zone be compacted to at least 98% of the maximum dry density to reduce the potential of future settlement related issues under paved areas. We also recommend particular attention be paid to the

compaction efforts around manholes and service lines to reduce the potential of future related settlements issues.

Extensive proof rolling, as noted in the “Pavement Design Considerations” section of this report should be performed on all utility trenches within areas to receive pavement. Deficient areas noted by the geotechnical engineer during the proof rolling operations should be removed to the recommended depth and replaced as required.

Freezing Weather

Soils which are allowed to freeze will heave and lose density. Upon thawing, these soils will not regain their full original strength and density. The extent of heave and density or strength loss depends on the soil type and moisture condition; and is usually more pronounced in finer grained soils. Foundations, slabs, and other improvements affected by such frost movements should be protected from frost intrusion during freezing weather.

Ideally, winter excavation should be limited to areas small enough to be refilled to a grade higher than the finished grade on the same day. Trenching back down to unfrozen soils for foundation construction can then be performed just prior to footing placement. The excavated trenches should be protected from freezing by means of insulating or heating during foundation construction. Backfilling of the foundation trenches should be performed immediately after the below grade foundation construction is finished. All new fill should not be allowed to freeze during or after placement. In addition, any interior footings, or footings designed without frost protection should be extended below frost depth, unless adequate precautions are taken to prevent frost intrusion until the building can be enclosed and heated.

Strong, durable concrete that meets the requirements of the project specifications will develop only if it is properly manufactured, placed and protected. The necessity for protection increases as the ambient temperature decreases. Procedures for manufacturing, placing and curing concrete in cold weather should be followed as outlined in ACI 306R.

Drainage and Moisture Protection

Standard equipment should be adequate for excavations into the site colluvium soils and sandstone bedrock for the proposed foundations and slabs. Please note, the deeper, very dense sandstone bedrock may require the use of larger excavator. The soils may pump and become unworkable under loading of heavy construction equipment and high moisture contents. Scarification and drying or use of specialized equipment may become necessary. Proper drainage should be maintained both during and after construction so that surface water is not introduced to the excavations.

SLOPE STABILITY

General

The owner and contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our client. Under no circumstances should the information provided below be interpreted to mean that Aaron Swan & Associates, Inc., is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Excavations and Slopes

The Contractor should be aware that slope height, slope inclination or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations, such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

As a safety measure, it is recommended that all vehicles and soil piles be kept a minimum lateral distance from the crest of the slope equal to no less than the slope height. Also, the exposed slope face should be protected against the elements.

We recommend that you retain us to monitor the soils exposed in all excavations and provide engineering services for such slopes. This will provide an opportunity to monitor the soil types encountered and to modify the excavation slope as necessary as we check the excavation for low density areas. It also offers an opportunity to verify the soil type and stability of the excavation slopes during construction.

EARTHWORK

General

The conclusions in this report are contingent upon compliance with recommendations in this section.

Site Clearing

Strip and remove all existing topsoil in the foundation, floor slab and pavement areas and additional soils as directed in this report. Any deleterious materials from the construction area and at least five feet beyond should be removed. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Excavation

Standard equipment should be adequate for excavations for the proposed construction. Any existing buried utilities located within the proposed construction area should be removed. All existing building materials, foundations or rubble encountered should also be removed from the site. The resulting excavations should be examined by the geotechnical engineer or the geotechnical engineer's representative prior to the placement of new fill soils.

Foundation and Floor Slab Preparation

To provide a suitable bearing surface for the proposed construction, remove the soils as directed in this report. Have the geotechnical representative observe the excavations and perform any necessary testing to determine if any low density or otherwise unsuitable areas are present prior to the placement of the engineered fill material.

Materials

1. Clean on-site and imported soils may be used as fill material for the following:

    -Exterior foundation backfill
    -Utility trench backfill
    -Overlot grading purposes

2. Frozen soils should not be used as fill or backfill.

3. The granular engineered fill should be a non-expansive material with a maximum size of 2-inches, 40% to 85% passing the #4 sieve, and no more than 15% passing the #200 sieve, with a liquid limit of less than 25.

4. We recommend a minimum of 6-inches of clean granular fill material/leveling course (maximum size of 1-inch, less than 7% by weight passing the #200 sieve, and less than 40% passing the #40 sieve) be placed below all floor slabs.

Placement and Compaction

Based on our information and experience, the following procedures for placement and compaction of soils have been used successfully on other projects in the project vicinity.

1. Following the soil removal in the building areas and prior to fill and foundation placement, the exposed native soils should be observed and/or tested by the geotechnical representative to verify soil type and strength.

2. Place and compact any necessary fill in horizontal lifts using equipment and procedures that will produce recommended water contents and densities throughout the lift. All backfill should be placed in loose lift thicknesses of 8-inches or less. If hand-operated compaction equipment is used, the loose lift thickness should be reduced to 4-inches or less. We recommend that compaction testing of the soils be completed at the following intervals:

-Footing trenches: 1 test for each 50 feet of trench for each 1-foot lift.

-Slab areas: 1 test for each 2,500 square feet of floor area per 1-foot lift (minimum of 2 tests per lift).

-Backfill: 1 test per 50 feet of foundation backfill (interior and exterior) for each foot of fill placed.

3. No fill should be placed over frozen ground.

4. Compaction Requirements (% of Standard Proctor ASTM: D698)

-Footing Areas:	95%
-Interior Slab Areas:	95%
-Exterior Slab Areas:	95%
-Interior Backfill:	95%
-Exterior Backfill:	90%

*Any backfill supporting pavement, sidewalks or other structural elements should be compacted to at least 95%.

5. On-site and approved imported silt/clay soils should be compacted within a moisture range of -1 to +3% of optimum according to Standard Proctor (ASTM: D698). Granular (sand) site soils or engineered fill should be moisture conditioned to within ±3% of optimum moisture content prior to being placed.

COMPLIANCE

Recommendations for slabs-on-grade and foundation elements supported on compacted fills or prepared subgrade are dependent upon compliance to "Earthwork" recommendations. To assess compliance with these recommendations, observation and testing should be performed under the direction of a geotechnical engineer.

CLOSURE

Our conclusions and recommendations are predicated on observations and testing of the earthwork preparations directed by a geotechnical engineer. Responsibility for any design or construction work or for our conclusions, recommendations, opinions or interpretations, either oral or written, cannot be accepted unless we perform the plan and specification review and construction monitoring to determine whether or not the work performed is in substantial compliance with our conclusions, recommendations, opinions or interpretations, and whether changed soil conditions have occurred.

Deviations from our recommendations by the plans, written specifications, or field applications shall relieve us of responsibility unless our written concurrence with such deviations has been obtained.

Aaron Swan & Associates, Inc.

Soil Boring Number: B-1

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.435110 **LONGITUDE** -96.700680
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1424.3'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	9	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist (CL)										
3				11	SS		20.00	98.00			
4											
5											
6	6.5			5	SS						
7	End of Boring										
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
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21											
22											
23											
24											
25											
26											
27											
28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A	
WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A	
WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A		CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	

NOTES: -

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-2

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.435460 **LONGITUDE** -96.700130
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1425.1'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	11	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, lenses of sand, soft to stiff, dry to moist (CL)										
3				5	SS						
4											
5											
6	6.5			10	SS		21.00	105.00			
7	End of Boring										
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
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21											
22											
23											
24											
25											
26											
27											
28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A	
WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A	
WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A		CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	

NOTES: -

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-3

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.435400 **LONGITUDE** -96.699850
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1425.3'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	9	SS		18.00	102.00			
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, lenses of sand, soft to stiff, dry to moist (CL)										
3				10	SS		19.00	110.00	46	13	
4											
5	5										
6	Clayey Silt, brown mottled, stiff, moist 6.5			5	SS						
7	End of Boring										
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
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24											
25											
26											
27											
28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A	
WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A	
WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A		CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	

NOTES: -

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-4

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.435560 **LONGITUDE** -96.699460
DATE COMPLETED 09/04/2026
RIG TYPE Hand Auger
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1426.3'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil		Hand						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist (CL)				Hand						
3											
4	4				Hand						
5	End of Boring										
6											
7											
8											
9											
10											
11											
12											
13											
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26											
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28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A	
WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A	
WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A		CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	

NOTES: Performed with Hand Auger due to uncertain utility locations

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-5

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.435170 **LONGITUDE** -96.700240
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1424.6'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	11	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist - mottled soil at 6.5 ft (CL)										
3				13	SS		18.00	104.00			
4											
5											
6 ▽				10	SS		20.00	105.00			
7											
8				13	SS		19.00	105.00			
9											
10											
11				8	SS		21.00	107.00			
12											
13											
14											
15											
16	16.5			12	SS		21.00	106.00			
17	End of Boring										
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A
▽	WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A
▼	WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	■	CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A

NOTES: Mottled soil at 6.5 ft indicates seasonal high water table

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-6

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.434920 **LONGITUDE** -96.700310
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1424.6'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
0	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	11	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist - mottled soil at 5.5 ft (CL)			13	SS		17.00	106.00			
5 ▽				10	SS		20.00	105.00			
8				13	SS		19.00	107.00			
10				8	SS		21.00	107.00			
15				12	SS		21.00	106.00			
16	16.5										
17	End of Boring										

WATER LEVEL & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A
▼	WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A
▼	WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	■	CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A

NOTES: Mottled soil at 5.5 ft

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-7

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.434810 **LONGITUDE** -96.700060
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1424.6'
DEPTH -

Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	13	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist - mottled soil at 5.5 ft (CL)										
3				21	SS						
4											
5 ▽				18	SS		14.00	103.00			
6											
7											
8				15	SS		20.00	107.00	42	19	
9											
10											
11				14	SS						
12											
13											
14											
15											
16	16.5			12	SS						
17	End of Boring										
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A
▼	WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A
▼	WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	■	CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A

NOTES: -

Date Printed: September 18, 2026 | Project #: 26G-061

Aaron Swan & Associates, Inc.

Soil Boring Number: B-8

PROJECT Harrisburg City Hall
GENERAL LOCATION 150 Columbia Street North
PROJECT NUMBER 26G-061
LATITUDE 43.434860 **LONGITUDE** -96.699720
DATE COMPLETED 09/04/2026
RIG TYPE AMS Track Rig
DRILLER CR **LOGGED BY** KL
TOOLING -
SURFACE ELEV. 1424.8'
DEPTH -

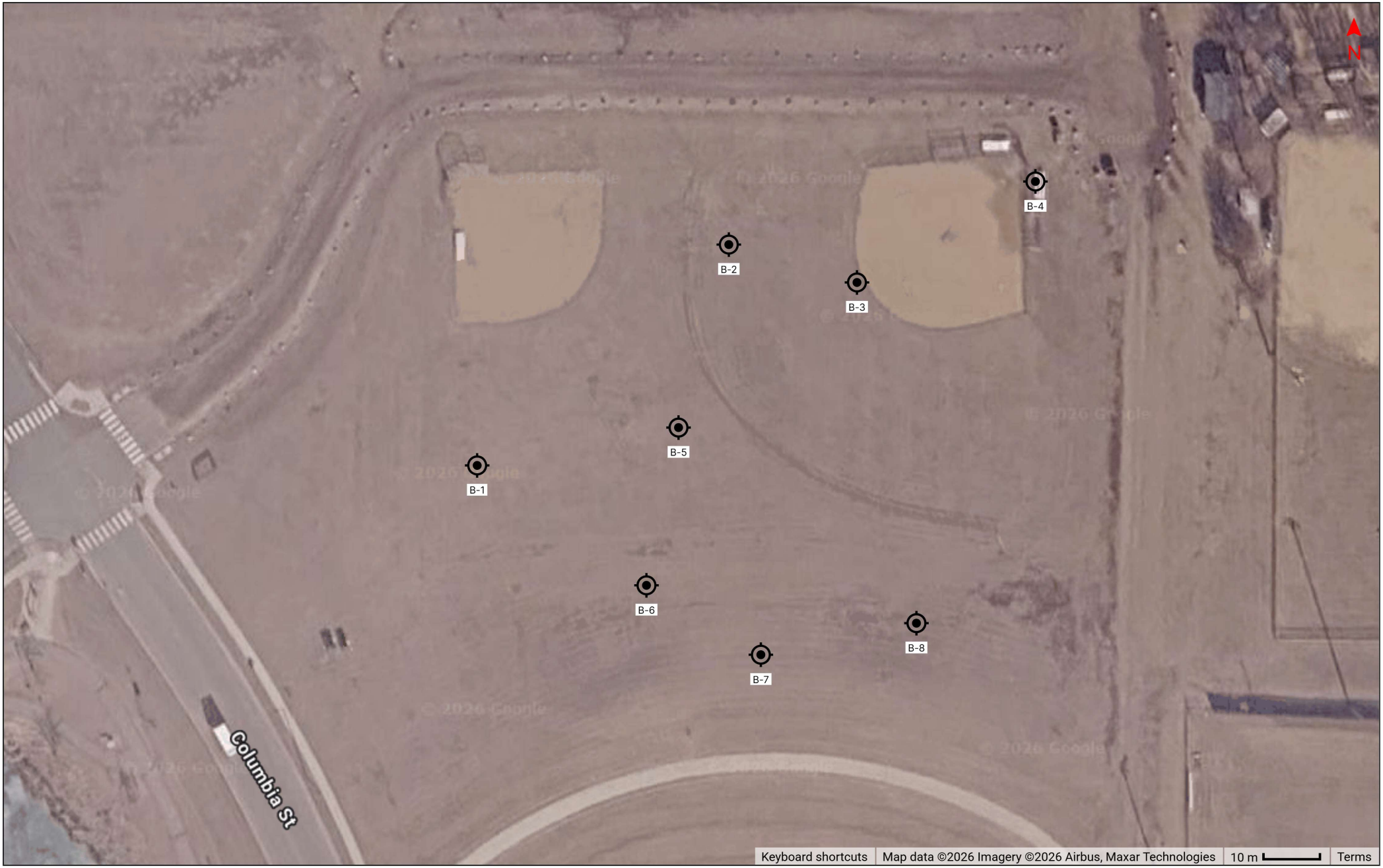
Depth (ft)	Material Description	Log	Geology Unit	N-Value	SAMPLE TYPE	REC (IN)	Lab WC	Lab Den (PCF)	Lab LL	Lab PL	Lab % Passing #200
1	**Organic Silt**, Topsoil, mostly silty clay, dark brown, dry (OL) 0.5		Topsoil	13	SS						
2	**Lean Clay**, Lean Clay, trace of sand and gravel, brown, soft to stiff, dry to moist - mottled soil at 5.5 ft (CL)										
3				6	SS						
4											
5 ▽				9	SS		21.00	97.00			
6											
7											
8				11	SS		22.00	106.00			
9											
10											
11				13	SS						
12											
13											
14											
15											
16	16.5			15	SS						
17	End of Boring										
18											
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28											
29											

WATER LEVEL & CAVE-IN OBSERVATION DATA

▽	WATER ENCOUNTERED DURING DRILLING: N/A		CAVE - IN DEPTH DURING DRILLING: N/A
▼	WATER ENCOUNTERED AT COMPLETION (0 HOURS): N/A		CAVE - IN DEPTH AT COMPLETION (0 HOURS): N/A
▼	WATER ENCOUNTERED AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A	■	CAVE - IN DEPTH AFTER COMPLETION TIME AFTER COMPLETION: - DEPTH: N/A

NOTES: -

Date Printed: September 18, 2026 | Project #: 26G-061



Aaron Swan & Associates, Inc.	PREPARED BY	PROJECT	LOCATION	SYMBOL KEY
	Aaron Swan & Associates Blackhawk, SD	Name: Harrisburg City Hall Number: 26G-061		Soil Boring

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Harrisburg City Hall

B. Owner's Name: City of Harrisburg.

C. Architect's Name: CO-OP Architecture.

D. The Project consists of the construction of the Harrisburg City Hall.

1.02 CONTRACT DESCRIPTION

A. Contract Type: Owner has the option of awarding a single prime contract or multiple prime contracts, each based on a Stipulated Price.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of construction work is indicated on drawings.

1.04 WORK BY OWNER

A. Items noted OF/OI (Owner Furnished/Owner Installed) will be supplied and installed by Owner before Substantial Completion.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

1.06 CONTRACTOR USE OF SITE

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Provide access to and from site as required by law and by Owner:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Utility Outages and Shutdown:
   1. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 012100 - Allowances: Payment procedures relating to allowances.

B. Section 012200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

C. Section 017800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

E. Execute certification by signature of authorized officer.

F. Submit three copies of each Application for Payment.

G. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.

F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

1.02 RELATED REQUIREMENTS

A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect in association with Owner's testing acency.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.
7. Any work that is not properly documented at the time of removal or placement

1.07 SCHEDULE OF UNIT PRICES

A. Item A – Over Excavation of Unsuitable Material: $_____per CuYd

B. Item B – Imported and Compacted Fill: $_____ per Ton

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

A. Add Alternate No. 1A - Site Furnishing:
   1. As shown & indicated on the contract drawings, provide and install Site Furnishing.
      a. Base Bid Item: No work.
      b. Alternate Item: Provide and install site furnishings as specified and shown on drawing sheet L101.

B. Deduct Alternate No. 1B - Z Furring:
   1. Provide steel Z girts in lieu of thermally broken Z girts to support continuous insulation.
      a. Base Bid Item: Provide composite framing support (CFS) system per Section 072100-Thermal Insulation.
      b. Alternate Item: Clark Dietrich, Product Code 250ZG-43 or equal.

C. Add Alternate No. 1C - Site Lighting:
   1. As shown & indicated on the contract drawings, provide and install all materials and work necessary for Type BB pathlights.
      a. Base Bid Item: Provide and install Type BB pathlights indicated as base bid on drawings sheet E100.
      b. Alternate Item: Provide and install additional Type BB pathlights indicated as alternate on drawing sheet E100.

D. Add Alternate No. 1D - Acoustic Wall Panels:
   1. As shown and indicated on the contract drawings, provide and install Acoustical Wall Panels.
      a. Base Bid Item: No work.
      b. Alternate Item: Provide and install all Fiberglass Sound-Absorbing units (WP-1) shown on architectural drawings.

E. Deduct Alternate No. 1E - Spray Foam Insulation
   1. Provide foamed in place insulation in lieu of continuous rigid insulation at all exterior walls.
      a. Base bid item: Provide Extruded Polystyrene (XPS) Continuous Insulation Board per Section 072100-Thermal Insulation at all exterior walls.
      b. Alternate Item: Provide Foamed-In-Place insulation per Section 072119-Foamed-In-Place Insulation at all exterior walls.

F. Add Alternate No. 1F - Reception Desk
   1. Provide and install all materials and work necessary for ballistic construction in lieu of non-ballistic construction at reception desk.
      a. Base bid item: At reception desk, provide butt-glazed 1/4" tempered glass in lieu of Security Transaction Window and remove ballistic resistant panels.
      b. Alternate Item: As shown on drawings at reception desk, provide security transaction window per Section 085653-Security Windows and ballistic resistant panels per Section 102641-Ballistic Resistant Panels.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Intrustions to Bidders.

B. Section 012200 - Unit Prices, for additional unit price requirements.

C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms included in the Project Manual are adequate for this purpose, and must be used.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Substitution requests that are approved will be documented in the project addenda.

END OF SECTION

PRIOR APPROVAL / SUBSTITUTION REQUEST FORM

Date:

Company Submitting Request:
(Name and Address)

Contact Name: _____ **Phone:** _____ **Fax:**

E-Mail:

PROJECT NAME:

SPECIFIED ITEM:
(Section) (Page) (Description)

The undersigned requests consideration of the following product substitution:

PROPOSED SUBSTITUTION:
Provide Product Name / Model /Manufacturer

1. Attached data includes: _____ Product Description _____ Performance and Test Data _____ Drawings _____ Specifications _____ Photographs

2. _____ Yes / No changes will be required to the Contract Documents for the proper installation of proposed product substitution. If yes, then attach data that includes description of changes.

The undersigned states that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on the drawings.

2. No changes to the building design, engineering design, or detailing are required by the proposed substitution.

3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or **specified warranty requirements.**

4. No maintenance is required by the proposed substitution other than that required for originally specified product.

5. Other Information

The undersigned further states that they have read the corresponding specification section in the project manual and confirms that the function, appearance and quality of the proposed substitution are equivalent or superior to the originally specified product._initial.

Signature: _____ Printed Name:

Fax Number:

For Architect's Use:

____ Accepted ____ Accepted As Noted ____ Incomplete Information

____ Not Accepted ____ Received Too Late ____ No Substitutions Accepted For This Product

Reviewed By / Date: _____

Processed by Addendum No. _____

Comments:

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Requests for Information (RFI) procedures.

H. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. It is Contractor's responsibility to submit documents in PDF format.
   3. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.

4. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
5. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
6. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: Use one of the following:
1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
2. Procore.
3. Requests for using an alternative submittal service will not considered.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's Superintendent.
5. Major Subcontractors.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.

7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

3.05 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare using software provided by the Electronic Document Submittal Service.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Discrete and consecutive RFI number, and descriptive subject/title.
3. Issue date, and requested reply date.
4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs

received after 12:00 noon will be considered as having been received on the following regular working day.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   2. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 013216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.07 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Shop drawings.
   4. Samples for selection.
   5. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.08 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Certificates.
   2. Test reports.
   3. Inspection reports.
   4. Manufacturer's instructions.
   5. Manufacturer's field reports.
   6. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.

2. Operation and maintenance data.
3. Warranties.
4. Bonds.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   5. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   6. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
   7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   8. Provide space for Contractor and Architect review stamps.
   9. When revised for resubmission, identify all changes made since previous submission.
   10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Submit concurrently with related shop drawing submittal.
   4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

E. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

F. Transmit each submittal with a copy of approved submittal form.

G. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

H. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

I. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

J. Schedule submittals to expedite the Project, and coordinate submission of related items.

K. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

L. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

M. Provide space for Contractor and Architect review stamps.

N. When revised for resubmission, identify all changes made since previous submission.

O. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

P. Submittals not requested will not be recognized or processed.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
2) Non-responsive resubmittals may be rejected.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

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

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

E. Indicate delivery dates for owner-furnished products.

F. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance.

B. References and standards.

C. Control of installation.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Defect Assessment.

1.02 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
   1. Temporary sheeting, shoring, or supports.
   2. Temporary scaffolding.
   3. Temporary bracing.
   4. Temporary falsework for support of spanning or arched structures.
   5. Temporary foundation underpinning.

1.03 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
   1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Concrete Mix Design: As described in Section 033000 - Cast-in-Place Concrete. No specific designer qualifications are required.
   2. Structural Design of Wood Decking: As described in Section 061500 - Wood Decking.
   3. Structural Design of Glued-Laminated Construction: As described in Section 061800 - Glued-Laminated Construction.
   4. Structural Design: Include calculations for resisting wind loads, anchor locations, loads at points of attachment to building structure, physical characteristics, resulting dimensional limitations as described in Section 084413 - Glazed Aluminum Curtain Walls.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.

b. Professional licensure information.
c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Conformance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

G. Accepted mock-ups shall be a comparison standard for the remaining Work.

H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

2.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

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

4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION

SECTION 01 45 23
QUALITY CONTROL – TESTING AND INSPECTING SERVICES

PART 1- GENERAL

1.1 WORK INCLUDED

A. Extent of work of this section includes all labor, materials, equipment and services necessary for the testing of specific contractor installed materials in the Construction Documents.

B. As the Testing Laboratory is not a Contractor; the normal services and agreements in the general conditions and bidding procedures do not apply. This section, governs the procedures.

1. Testing Laboratory performance is governed by the laws of the **State of South Dakota.**

C. Selection, payment and use of Testing Laboratory Services

1. By providing a cost for the services described below directly to the owner, on the date of other bids, the Testing Laboratory shall be retained and paid for by the Owner, except as noted. The Testing Laboratory shall act in all matters relating to testing.

a. Contractors will not control the means or the methods of testing or inspections. Contractors must however provide scheduling information to the Testing Laboratory.

b. Testing agency will contact the Architect and Engineer for instructions on scope of the work, if necessary.

D. It shall be the responsibility of the Testing Laboratory to familiarize themselves with all sections of the Contract Documents and the project schedule.

E. All testing required of this project shall be performed by a single testing laboratory.

F. The testing requirements shall remain in force for the full duration of the construction contract, including all delays or time extensions.

G. Provide to the Contractor, contact information, list of items to be inspected and other information to assist the Contractor in scheduling his work, while allowing for inspections and tests of this section.

H. Related Contract Documents.

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and remaining Division 00 and 01 Specification Sections as they apply to this section.

1.2 TESTING LABORATORY REQUIREMENTS OF COST AND ABILITY

A. All testing laboratories desiring to provide their services for this project must submit for approval to the Owner, at the time and date of bid, for review by the Architect the following:

1. Documentation that the Testing Laboratory meets requirements of the American Council of Independent Laboratories (ACIL).

2. Provide documentation that the Testing Laboratory has an in-house quality assurance program.

3. Proof that the Testing Laboratory is owned and directly managed by a Professional Engineer, licensed in the State where testing and inspections occur.

a. Principals of the Testing Laboratory and their project managers must be registered professional engineers with a minimum of five years experience in the types of testing required under this contract. Each person in charge of laboratory testing, field-testing and inspection must have not less than one's years experience in the duties performed under this contract and shall perform their duties only under the direct supervision of a registered professional engineer.

4. Total price of services for the project, as a bid, based on the scope of the work shown in this section and the laws of the state of South Dakota as they relate to professional engineering services.

   a. Use Bid form provided in Project Manual.

   b. This bid if made into a contract is not subject to retainage.

   c. This bid is a lump sum made on the basis of a computation of unit prices for testing and observation services. At the end of this section a quantity of units in terms of hours and or specific activities is given. The bid provided shall be based on that information.

      ** The Quanity of tests required is part of the submittal by the Testing Laboratory to the Owner. (See end of Part 3)*

   d. Provide a unit price for each hour or quantity asked for. These unit prices shall become the basis, if required, to provide additional testing services.

1.3 REFERENCES

A. ANSI/ASTM E329 - Standard Practice for Use in the Evaluation of Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

B. ASTM E543 - Practice for Determining the Qualifications of Agencies Performing Nondestructive Testing.

C. ASTM E548 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

D. ASTM A802 – Standard Practice for examination of steel castings, surface acceptance and visual examination.

E. ASTM E174 Standard Practice for Radiographic Examination.

F. ASTM C1077 – Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

G. ASTM C1093 - Practice for the Accreditation of Testing Agencies for Unit Masonry.

H. ANSI/ASTM D3740 - Standard Recommended Practice for Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

I. ASTM D4561 – Practice for quality control systems for an inspection and testing agency for bituminous paving materials.

J. ASTM E699 – Practice for criteria for evaluation of agencies involved in testing, quality assurance, and evaluating building components in accordance with test methods promulgated by ASTM committee E6.

L. ICBO Model Program for Special Inspection (excerpts).

N. CASE-Council of American Structural Engineers.

O. AIA Document A201 - General Conditions - 1997 Edition

1.4 RELATED SECTIONS

A. Project specifications and plans for all items to be inspected.

B. Schedule as shown in Division 01 in Project Specifications.

C. Submittals section in Division 01 as shown in Project Specifications.

D. Contract closeout section in Division 01 as shown in Project Specifications.

E. Project meeting Section in Division 01 as written in Project Specifications.

1.5 REPORTS OF TESTING

A. Written Reports: Submit all test reports to Owner, Architect and Engineer, within 72 hours after each test is completed. Contractor shall also be given a copy.

B. Verbal Phone Reports: Testing Laboratory is to give immediate verbal notification, to the Owner, the Architect, and to Heyer Engineering, immediately of any irregularity, failure, or non-compliance of tested items to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work

C. Test Standards: Testing Laboratory shall furnish the Architect and Engineer upon request, one (1) copy of each standard (ASTM, AASHTO and AWS) referred to or which is pertinent to these specifications.

D. All reports, written and verbal, must state clearly whether work inspected or tested is/is not in compliance with Contract Documents.

1.6 PAYMENT OF TESTING SERVICES

A. Initial services:

1. The Owner, will pay for all initial-testing services requested by and anticipated by this specification. Costs for all such testing services shall be included in a proposal submitted directly to the Owner through the Architect. See information in this section.
    a. See form at end of this specification section 3 for the required testing units. These units in either hours or events will form the basis of the cost of testing laboratory services.
2. Owner will through the Architect issue a change order if additional services are required. These additional services must be agreed to in writing by the owner, the testing laboratory and the architect. Additional services will be based on unit prices submitted by the testing laboratory and listed at the end of this specification section.

B. Additional or re-testing:

1. When initial tests indicate non-compliance with the Contract Documents, all subsequent re-testing occasioned by the non-compliance shall be performed by the same Testing Laboratory and the costs thereof will be borne entirely by the **Contractor.** If needed the Owner, through the Architect, will deduct the amount of the re-testing from the Contractors pay request.

C. Contractor required specimens and tests not in this Specification Section.

1. Products and materials, such as concrete, masonry, mortar or proposed engineered fill, requiring a test report or a design done by a Professional Registered Engineer prior to use; shall be performed by the Contractor and are not a part of the cost of this section for the Testing Laboratory Services.
2. Mechanical balancing, adjusting, or startup of systems or motor startup by either Mechanical, Electrical, or Plumbing Contractors is not a part of this work.

1.7 NON COMPLIANCE WORK STOPPAGE

A. The Testing Laboratory shall act as the Owner's agent in testing and inspections on items in this section to determine compliance with plans and specifications.

B. The Testing Laboratory ***shall further*** **advise the Owner, the Architect and the Structural Engineer if the non-compliance should result in the Owner** stopping that type of work from being performed until corrective action or replacement is completed. Based on the following criteria:

1. If additional work would be added to existing non-complying work, adding additional expense to the Contractor to remove.
2. It is clear by the quality and status of the non-complying work that the Contractor will continue to produce substandard work.
3. It is clear that the Contractor does not understand how the work is to be produced in a manner consistent with the Contract Documents.
4. A required inspection by a governmental official cannot be done unless further work is stopped, or work needed to be inspected is in danger of being covered.
5. Public or worker safety in the sole opinion, of the Testing Agency, would be compromised if the work continues.

1.8 LIMITS ON AUTHORITY

A. Employment of the Testing Laboratory in no way relieves the Contractor of his obligation to perform work in accordance with requirements of Contract Documents.

B. Inspection firm may not release, revoke, alter, or enlarge any requirements of the Contract Documents.

C. Inspection firm may not approve or accept any portion of the work.

D. Inspection firm may not assume any duties of the Contractor.

E. As stated in Section 1.6 above, Owner, not Testing Laboratory, has authority to stop work.

F. Mechanical balancing, adjusting or startup of systems or motor startup by either Mechanical, Electrical or Plumbing Contractors is not a part of this work.

1.9 CONTRACTOR SCHEDULING AND NOTIFICATION RESPONSIBILITY

A. Even though Contractor is not paying for the work of this section. He must perform the notification and scheduling of all Testing. Therefore Contractor shall:

1. Provide notification to the Testing Laboratory based on schedule of all work to be inspected. Inspections missed due to the Contractor not notifying Testing Laboratory shall require contractor dismantling and un-covering of in place work.

   a. If this is not done, the Owner, will stop all construction at the contractor's expense until he receives the proper documentation that the tests were performed. Once the engineer has approved the criteria and testing results, the work may proceed.

2. The Testing Laboratory shall attend the pre-construction meeting and all other meetings during work that is to be inspected to familarize themselves with the project, the contractors and the project schedule.

   a. The Contractor is responsible for the project schedule and for scheduling of all testing.

3. When changes of construction schedule are necessary during construction, the Contractor shall make contact with the Testing Laboratory to determine such schedule changes.

   a. The Testing Laboratory will not be held accountable for lack of inspection when a Contractor purposely covers portions of the work to be inspected.

4. Provide incidental labor and materials to provide access to work to be inspected. Such as having ladders, available scaffolding and other components readied and in the same safe condition as that available for they're own workmen.

5. Inspection or testing performed exclusively for a Contractor's convenience shall be the sole responsibility of the Contractor. This includes strength tests for OSHA or AWAIR.

1.10 TAKING SPECIMENS

A. All specimens and samples for testing will be taken only by the Testing Laboratory; all sampling equipment and personnel will be provided by the Testing Laboratory; and all deliveries of specimens and samples to the Testing Laboratory will be performed only by the Testing Laboratory.

1. The only exception for taking of specimens is that the Masonry Contractor may take his own mortar test cylinders. However they must be transported by the Testing Laboratory.

B. Contractors shall provide representatives of the Testing Laboratory access to the work at all times in order that the Laboratory may properly perform its functions.

1.11 CODE COMPLIANCE TESTING

A. Inspections and test required by codes or ordinances, or by a plan approval authority, not listed in Part 3 Execution, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1. Contractor, not Testing Laboratory, is responsible for design of certain materials to be used in the field such as concrete and mortar mix designs and design of precast, wood and light gauge engineered assembles and systems.

1.12 SPECIAL INSPECTIONS

A. All requirements under the Special Inspections portion of the International Building Code are separate items not listed under this section. They however are required by the Owner of the Contractor.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 VIBRATION CONTROL (Not Used)

3.2 EXCAVATION & BACKFILLING (Includes Special Inspection per CASE and IBC 2018)

A. The Testing Laboratory shall be on site to observe and monitor the mass site excavation and backfilling of the building structure area.

1. Verify that all unsuitable organic materials, black and soft soils have been removed.
2. Test the mass backfill and verify correct depth of material backfill lifts.
3. After mass backfill is complete, monitor and verify the correction of secondary settlement and inform the Architect/Structural Engineer and General Contractor the readiness for footing excavation to begin.

B. Inspect each footing and slab subgrade to determine if subgrade materials are acceptable. Perform hand auger borings and soil classifications. Make density tests to determine if the actual soil bearing values capacity complies with specified value.

C. Test all engineered fill materials as to density and optimum moisture content. Per ASTM D698.

1. Visit the site of the borrow pit or site and determine that anticipated values of sample are consistent with all materials to be used from the pit or site.
2. Use values determined from tests to calibrate site compaction and soil density work.

D. For footings or foundation walls. Take soil density and moisture tests at the site in all engineered fill areas. Test 4 corners of each 2000 s. f. or 2 locations in every 100 lineal foot of fill and backfill. This shall be done per every one foot of lift, of fill or backfill. Per Nuclear Density Method B in ASTM D2922 overall Basis.

G. Slab on grade work includes the use of vapor barrier and a 6" granular cushion. Examine both prior to placement of reinforcing steel to determine that:

1. All mechanical, electrical, underfloor drainage and or other below surface work are complete prior to installation of vapor barrier and or granular cushion. Do not allow placement until underground work is complete.
2. All vapor barrier seams are overlapped a min. of 12 inches. Sides of vapor barrier are raised up 12" over the top level of slab and are attached to walls and that all seams are taped.
3. The 6" granular fill is placed above the vapor barrier and the vapor barrier is not broken during placement.

3.3 GRADING FOR PARKING LOTS, DRIVEWAYS, APPROACHES

A. Testing agency 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.

B. Testing agency 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 Concrete or Asphalt Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area, but in no case fewer than three tests.
2. When testing agency 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.

3.4 ASPHALTIC CONCRETE

A. Verify at batch plant that asphaltic formulation meets project specifications.

B. Test aggregate base course for proper compaction and observe proof rolling for pumping.

1. Aggregate base course must be compacted to not less than 100% Standard Proctor maximum dry density ASTM D698.

2. Areas that are pumping must be cut out, relaid, recompacted and proof rolled.

A. Verify correct number of asphalt lifts are being laid.

B. Take bituminous course tests at every 5000 sq. feet for bitumen content, gradation of aggregate, field density, air void content and thickness. **(All tests must be taken after laydown but prior to rolling or compaction.)**

1. Test each course.

2. Density must be 95% of Marshall density.

3. Asphalt content by weight shall be 6.0 to 8.0% of the total mixture.

4. Air void Content shall be 3-5% maximum as per ASTM 2041.

C. Using surveying equipment and or lasers verify drainage of all paved areas after compaction and rolling. Drainage in all paved areas to be a minimum of ¼" per foot.

1. Test at random 10'-0" areas so that surface is smooth to ¼" +- in 10'-0" area.

All bird baths must be redone.

3.5 FORMWORK (Includes Special Inspection per CASE and IBC 2018)

A. Verify formwork for all concrete will result in member size, location, and configuration as described on the contract documents, as it affects the structural integrity of the concrete elements to be placed.

1. Measure distance between forms and reinforcing to determine proper coverage of reinforcing.

2. Check for form oil or lubricants on reinforcing.

3. Verify that formwork is properly tied and supported.

3.6 REINFORCING STEEL (Includes Special Inspection per CASE and IBC 2018)

A. All steel bars must be positively identified as to heat number and mill analysis. Reports to be provided by the supplier. All reinforcing steel shall have a number assigned to it corresponding to the placement mark on the submittal.

1. All steel bars that cannot be identified by heat number and mill analysis shall have one tensile and one bend test made for each 2-1/2 tons or fraction thereof, of each size and kind of reinforcing steel.

Testing procedure shall conform to ASTM A615.

B. No reinforcing steel shall be placed without an approved shop drawing.

C. The testing laboratory shall verify size and location of all bars prior to concrete placement.

1. Verify that chairs or similar product have been provided and are in place for all slab reinforcement.

D. A written report shall be submitted to the Engineer stating the results of the verification and any modifications required by the General Contractor to meet the plans and or specifications.

3.7 CONCRETE (Includes Special Inspection per CASE and IBC 2018)

A. Portions of the following such as Engineered mix design are furnished by the installing Contractor; Testing of Concrete in the field is performed by the Testing Agency under the Owner.

B. **After Contractors Mix design work is complete, field testing shall occur as follows:**

a. Contractor or Testing Lab shall perform slump tests and take strength test cylinders (minimum of 5) at the point of application, or after it has been pumped, during first day's work. If a plasticizer is being used, test before and after addition of plasticizer and so note on the test report. Non

compliant tests shall mean non-use of that trucks' product. All other days work shall be tested on every other truck after it has passed through the pumper.

b. Air entrainment tests shall be taken in the same manner as the concrete slump tests **but shall be taken by the Testing Laboratory.**

2. If slump or air content falls outside specified limits another test shall be made immediately from another portion of same batch. If this test likewise fails, the concrete of that load shall be discarded and the truck carrying it shall not be allowed to unload at the site for 1 hour. Truck identification number shall be recorded if this procedure is necessary

3. Notify batch plant of mix irregularities and request materials and proportioning check

4. Use and reporting of Field Samples:

a. Testing Lab shall perform laboratory strength tests on actual concrete work. Provide a single cylinder 7 day test and a final 28 day test with an average of 3 test cylinders, Keep one additional cylinder as a field hold to be tested in cold weather or as needed. A total of 5 (five)-test cylinders are required. Contractor may keep additional cylinders for use in determining form removal timing and to verify OSHA strength requirements for steel columns. Take daily tests on every 50 yards of each type of concrete used.

b. Furnish certified compression test reports to Owner, Engineer, Architect and Concrete Contractor. On test report indicate following information:

- Cylinder identification number and date cast.
- Portion of structure and location of structure where tested
- Type of concrete, slump and percent air.
- Compressive strength of concrete in PSI.
- Weather conditions during placing.
- Temperature of concrete.
- Maximum and minimum ambient temperature during placing.
- Ambient temperature when concrete sample in test cylinder was taken.
- Date delivered to laboratory and date tested.
- Certification by the plant that the specified mix design and all required admixtures are included.

11. Verify thickness of concrete walls, slabs, raised slabs and other concrete work.

12. Verify that concrete meets FF and FL level and flatness standards listed in Section 03300 or 03300 Part 3 Execution The system is designed to measure 4 20' x 20' test sections randomly chosen on the slab on grade and the raised deck floor not including stoops. The Sections should not adjoin each other unless the floor is less than 80'x 80' in size.

13. Verify that hot weather and or cold weather concrete installation requirements are being followed by the Contractor. If sufficient protections and methods are not being followed for the production, installation, protection and curing of concrete in cold weather or hot weather conditions, the pour must stop and only continue once conditions are remedied. See ACI 305R, ACI 306R.

3.8 STRUCTURAL STEEL BEAMS, COLUMNS(Includes Special Inspection per CASE and IBC 2018)

A. Verify that anchor bolts and their setting pattern is at correct elevation, allows for 1-1/2" grout under the base plate and that pattern matches Contract Drawings and reviewed shop drawings.

B. Welding:

1. Field-welded connections shall be inspected visually.

a. Fillet Welds - 50% of all connections, closely visually inspected as per AWS D1.1.

b. Partial Penetration - 50% of all connections, closely visually inspected as per AWS D1.1.

c. Full Penetration - 50 % of all connections, closely visually inspected as per AWS D1.1.

2. X ray testing of welded connections shall be required only if visual inspection determines that numerous (over 20%) flaws exist in the welding fillets and further visual inspection cannot be made to determine adequate welded connections.

C. Bolted Connections: Per AISC, All bolted connections shall be bolted with ASTM A325, Type 1, ¾" min. diameter bolts. All shear bolts at initial erection shall be snug fit tightened with a wrench.

1. After final erection tightening and correction of plumb and square of steel; all shear bolt connections shall have the additional requirement of paint stick match marking. Paint shall mark the connection surface, the bolt, and the nut. A final 1/4" turn past snug fit with a wrench shall be required. Then the threads shall be welded or damaged

2. Quantity of Bearing Connections inspected is: 20% of total number of connections. Each bolt in tested connection shall be tested for snug fit.

a. Retighten 100% of bolts in tested connection if any bolts within tested connections are not adequately tightened.

b. Retighten 100% of ALL bearing style connections if more than 10% of the tested connections contain bolts not adequately tightened.

c. Retest system as defined above, if system has to be re-erected.

3. Steel members shall be inspected to plumb, square and level. The standards shall vary but in general shall be no more than ½" per 16'-0"individual member.

3.9 FINAL REPORTING

A. At the conclusion of the work, required to be inspected by the Testing Laboratory, a written report in binder form with an index shall be submitted as a permanent record to the Owner through the Structural Engineer of all tests, logs, comments and written reports.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.02 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft. Job site security is the responsibility of the Contractor.

1.09 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

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

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

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

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

E. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Perform dewatering activities, as required, for the duration of the project.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

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

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
    1. Prevent movement of structure; provide shoring and bracing if necessary.
    2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
    3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
    1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
    2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
    1. Complete the work.
    2. Fit products together to integrate with other work.
    3. Provide openings for penetration of mechanical, electrical, and other services.
    4. Match work that has been cut to adjacent work.
    5. Repair areas adjacent to cuts to required condition.
    6. Repair new work damaged by subsequent work.
    7. Remove samples of installed work for testing when requested.
    8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 017900 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

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

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Specific requirements for operation and maintenance data.

C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings : Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

2.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

2.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Additional Requirements: As specified in individual product specification sections.

2.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.
   4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

2.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

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

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 030516
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Test Data: Submit report of tests showing compliance with specified requirements.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Vapor Block by Raven Industries.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Forms for all cast in place concrete
B. Form accessories.
C. Stripping forms.
D. Waterstops
E. Formdeck for stoops
F. Opening in forms for other effected work.
G. Shoring and reshoring as required. See structural notes page and details.

1.2 RELATED CONTRACT DOCUMENTS

A. Documents affecting work of this Section include, drawings and general provisions of Contract, all General and Supplementary Conditions and all other Division 0 and 1 Specification Section.

1.3 WORK INSTALLED BUT FURNISHED UNDER SECTIONS

A. Section 05 12 00 - Structural Steel: Steel fabrications attached to form work.

1.4 RELATED WORK

A. Section 03 20 00 - Concrete Reinforcement.
B. Section 03 30 00 –Cast-In-Place Concrete.
C. Section 05 12 00– Structural Steel

1.5 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.
B. ACI 315 - Details and Detailing of Concrete Reinforcement.
C. ACI 318 – Building Code Requirements for Structural Concrete.
D. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures
E. ACI 347 - Recommended Practice for Concrete Formwork.
F. PS 1 - Construction and Industrial Plywood.
G. ACI 117-Standard Specifications for Tolerances.

1.6 QUALITY ASSURANCE

A. Construct and erect concrete form work in accordance with ACI 301.
B. Tolerances:
    1. See ACI 117.

1.7 CONTRACTORS RESPONSIBILITY FOR FORMWORK DESIGN AND REMOVAL

A. The form-work system shall be designed to support freshly place concrete and reinforcing materials, It shall transfer all concrete loads to the bearing soils or to completed construction in a safe manner at all times. Remove formwork, in a manner that does not damage the concrete or the elements of the project. Under the requirements of the construction documents, IBC, All local Building codes, ACI, OSHA and Local Workmen's Compensation; The contractor, and not the engineer or architect, shall provide engineering as required to meet this obligation.

PART 2 – PRODUCTS

2.1 FORM MATERIALS (Earth is not an approved forming material)(Conform to ACI 301 and ACI 347 for design, fabrication, erection and removal of forms.)

A. Plywood: Douglas Fir or equal species; sound, undamaged sheets with straight edges, manufactured for concrete wall forms.
    1. Conform to Tables for form design in APA Form V-345, including strength.
B. Glass Fiber Fabric Reinforced Plastic Forms: Matched tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.
C. Steel: Minimum 16 gauge sheet, well matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
D. Form deck: 1.5C 20 gauge (min) ASTM A653 by Vulcraft or equal, galvanized in accordance with ASTM 924-94 to a min class of G90, unless otherwise noted on plans.

E. Circular pier or round column forms: Cardboard waxed or plasticized forms such as Sonotube or equivalent.

F. Do not leave aluminum materials, which may cause a corrosive reaction, embedded in the concrete. Aluminum forms are acceptable.

2.2 FORMWORK ACCESSORIES

A. Form Ties: factory fabricated, adjustable length, removable or snap off form ties which results in no metal being closer than 1 1/2" from surface of concrete when forms are removed.

B. Form Release Agent: Colorless material that will not stain concrete, or absorb moisture.
   1. Do not allow form release agent to come in contact with reinforcing steel or inserts in the concrete.

C. Fillets for Chamfered Corners: Wood strips or rigid plastic as detailed. ¾" x ¾".

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorage's: Sized as required; of strength and character to maintain form work in place while placing concrete.

E. Shelf Angle Inserts
   1. Wedge type inserts for 5/8" diameter bolts. Include horseshoe shims.
   2. Minimum capacity 2,100 pounds

F. Dovetail Anchor Slots:
   1. 1" deep with 5/8" throat, 24 gauge galvanized steel.

G. Flashing Reglets: 3/4" deep with 1/4" throat, 26 gauge galvanized steel.

H. PVC weeps: 3" diameter PVC pipe.

I. Waterstops: See plans and details for location.
   1. Extrudable non-leaching polyurethane products that will swell upon moisture contact.
      a. Sika Products: SikaSwell S one part water swelled extruded polyurethane sealant, including special triangular shaped nozzle.
      b. An equal approved product with one part polyurethane makeup that is free of bentonite or other leaching materials
   2. PVC Waterstop.
      a. Unless otherwise noted within the construction documents,4" Ribbed Center Bulb style shall be used at all cold formed joints in liquid bearing structures.
      b. Waterstop shall have a minimum design head pressure capacity of 100' or greater.
      c. PVC Waterstop must meet or exceed the performance required by U.S. Army Corps of Engineers Specification CRD-C 572-74.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork.

B. Depth or thickness of concrete being formed is to be as shown on plans. No variation in thickness or depth is allowed. (i.e.) a 4" slab is not to be poured at 3-5/8".

3.2 PREPARATION

A. Arrange and assemble formwork to permit dismantling and stripping so that concrete is not damaged during its removal.

B. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.3 ERECTION

A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

B. Construct forms in accordance with ACI 301.

3.4 TOLERANCES

A. Set and maintain forms to provide completed surfaces meeting the tolerances given in ACI 117. See Part 1 of these specifications.

1. Tolerances given in ACI 117 are not cumulative. Maximum tolerance for any formed surface, except footings, shall be one inch.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing thorough concrete. Fill these voids with a readily removable material to prevent entry of concrete into voids or:

1. Use void forming systems of correct size for openings required in the concrete. Follow manufacturers' instructions for proper strength ratings of void forms.

B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, including electrical boxes and conduit and other inserts.

1. Ensure that forms will provide sufficient coverage for reinforcing. See Section 03200 for requirements.

C. Install accessories in accordance with manufacturers' instructions level and plumb. Ensure items are not disturbed during concrete placement.

D. Apply extruded waterstop in form locations as shown on plans and details. Form all joints as a continuous ¾" bead strictly according to the manufacturer's instructions so that waterstops are continuous.

1. Following manufacturers' instructions, use largest of the 2 precut triangular nozzles to insure proper form and size of bead. Apply to clean, dry flat surfaces.
   a. Depending on concrete thickness more than one bead may be required. Consult manufacturer's instructions.
2. Waterstop must be allowed to pass through all form bulkheads. Notch bulkheads at end of all pour intersections.
   a. **To prevent waterstop damage**, install 2-3 hours prior to any concrete pour where vertical height is more than 20 inches. Use of a tremie to limit concrete drop to 20 inches is required if waterstop is less than 2 days old.
   b. If wall is higher than 10'-0" contact Engineer for use of SikaSwell Hose.

E. Build in dovetail anchor slots. Install anchor slots in concrete walls, columns, piers, beams and spandrels deeper than 14 inches and wider than 16 inches which will be in contact with masonry or elsewhere as indicated on the Drawings. Install anchor slots vertically, spaced 16 inches on center.

3.6 FORM RELEASE AGENT APPLICATION

A. Apply agent on formwork only in accordance with manufacturer's instructions.
   1. Apply prior to installation of reinforcing steel, anchoring devices or embedments.
   2. If unable to completely remove agent from unintended items, replace the reinforcing steel, anchors or embedments.

3.7 FORM REMOVAL

A. Replace concrete damaged by early removal of forms. Consult ACI 318, 301 and the following:
   1. Do not remove forms, shoring or bracing until concrete has sufficient strength to support its own weight, and construction and design loads that may be imposed upon it.
   2. Temperatures below 50 degrees F will prolong the timing of form removal.

B. Form removal timing: Contractor shall verify the exact timing of form removal using these minimum removal times based on 28 day strength design of concrete and ACI 318.
   1. Footings: 24 hours minimum.
   2. 12" Walls under 5'-0" and 5'0" columns: 36 hours minimum.
      a. For walls thicker than 12" and up to 20" add 8 hours.
      b. For walls thicker than 20" same as 3 below.
   3. Walls and columns over 5'-0": 72 hours minimum but not until concrete, by cylinder test, has reached 50% of its 28-day design strength.

4. Beams, girders, raised decks or floors: 75% of its 28-day design strength. No time limit.

C. Do not damage concrete surfaces during form removal.

D. Reshoring: Reshoring is designed to allow concrete to deflect and support its own weight after initial set has occurred and forms have been removed. Remove forms and tightly place reshores only after initial concrete deflection. Do not remove reshores until concrete has reached its specified strength.
   1. Apply no construction loads or other loads to members being reshored
   2. Provide reshores for all two-way slabs until concrete reaches specified strength.

E. At removal of forms patch all locations where wire ties protrude through the concrete or are exposed. Use primer and Non Shrink grout to solidly fill these holes. Also patch and grind to provide a smooth formed finish where required. See Part 1 of these specifications.

3.8 ALLOWABLE FACE & CORNER FINISHES

A. Rough Form Finish: Concrete faces not exposed to view in the finished work shall have a rough form finish as defined by ACI 347.3.4 as a Class D finish. Holes shall be no larger than 3/8” and honeycombing or surface irregularities shall be no more than 1” in a 5’-0” area. However any exposed reinforcing steel or ties must be solidly grouted to match reinforcing coverage requirements.

B. Smooth Form Finish: Concrete faces exposed to view in the finished work shall have a smooth form finish as defined by ACI 347.3.4 as a Class B surface. Class B surfaces have no more than ¼ “ abrupt or gradual irregularities in a 5’-0” area and no holes larger than 1/4” on the surface. The contractor shall grind the surface where necessary to comply with these ACI requirements.

C. Prominently exposed Class A finish: Concrete faces exposed to view as part of the architectural design or surfaces to receive finishes of any type (paint, textured paint, etc.) shall receive an class A smooth form finish as defined by ACI 347.3.4. These class A surfaces have no more than 1/8 “ abrupt or gradual irregularities in a 5’-0” area and no holes larger than 1/8” on the surface. The contractor shall then fill all holes and grind the exposed surface to provide a finish compatible with a heavily scrutinized surface.

D. Corners not exposed to view may be formed either square or chamfered.

E. Corners exposed to view shall be square, smooth, solid, unbroken lines except where a chamfered surface is called for on architectural plans
   1. Chamfered Corners shall be formed with chamfer strips to produce uniformly straight lines and tight edge joints. Unless otherwise stated the chamfers shall be 3/4" along both adjoining planes of the concrete edge. Extend the edges of the chamfers to the end of the formed surface. Match adjacent changes of direction by mitering to produce a connection without breaks in appearance. See architectural plans for where chamfers are required.

3.9 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Weldable and non-welded reinforcing steel bars, for cast-in-place concrete.

B. Support chairs, bolster, bar supports, ties and spacers for supporting reinforcement.

C. Adhesive installation of dowels and or bars into prior placed concrete, masonry or structure.

1.2 RELATED CONTRACT DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 0 and 1 Specification Sections apply to this Section

1.3 RELATED WORK

A. Division 2 Earth and Site work.

B. Section 03 10 00 - Concrete Forming and Accessories

C. Section 03 30 00 – Cast-In-Place Concrete.

D. Division 04 – Masonry

E. Section 05 12 00 – Structural Steel

1.4 REFERENCES (Except where noted use latest edition)

A. ACI 301 - Specification for Structural Concrete for Buildings.

B. ACI 350 – Code Requirements For Environmental Engineering Concrete Structures

C. ACI 318 – Building Code Requirements for Structural Concrete

D. ACI 315 - Details and Detailing of Concrete Reinforcement.

E. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.

F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

G. ASTM A 184/A - Welded Deformed Steel Bar Mats for Concrete Reinforcement.

H. ANSI/AWS D1.4 - Structural Welding Code Reinforcing Steel.

I. ASTM A615 – Standard Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

J. ASTM A706 – Welding Bars for Concrete Reinforcement.

K. CRSI - Manual of Practice.

1.5 QUALITY ASSURANCE

A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, and Documents 63 and 65.

B. Conform to ACI.

C. Have all reinforcing inspected by local authority and testing laboratory prior to concrete pour. See section 01 45 29.

1.6 SHOP DRAWINGS

A. Submit shop drawings in no more or no less than 4 copies. Shop drawings shall show arrangement and layout, bending and assembly diagrams, bar schedules, stirrup spacing, splicing and laps of bars and shall be prepared in accordance with CRSI standards.

B. Allow a minimum of 7 calendar days for processing not including shipping times.

C. Provide layout with gridline coordinates and dimensions. Provide in accordance with ACI publication SP-66 / 315R-94 and 315-92 detailing manual.

1. Provide cutting / bending lists and cut through concrete details that show all sizes, spacing, concrete cover, locations, splices and quantities of reinforcing steel.

a. Supporting devices are part of the work and must be shown on the submittal.

D. Make a request in writing to Heyer Engineering to use portions of original design contract document drawings for layout of their submittal. If agreed, comply with the following:

- The title block, sheet numbers and all designers' stamps, signatures and references are removed and are never to be used by the fabricator or user.
- Dimensions shown on contract documents are not verified and are not to be reused. Detailer shall create new dimensions from architectural contract documents for erection purposes. Gridlines only should be reused.
- Non-reinforcing elements except for concrete or masonry shall be removed.
- Details and elevations shown on contract documents are only for design and need to be completely redone by the detailer for erection purposes.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Non Welded Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel deformed bars, uncoated finish. Also includes smooth dowels. Use at all locations where A706 type is not specifically stated.

1. At construction joints, grease and wrap the exposed end portion of smooth dowels prior to next concrete pour.
2. See Structural details for corner bar requirements in footings, foundations and masonry.

B. Weldable Reinforcing Steel: ASTM A706 60 ksi yield grade low alloy steel deformed bars with uncoated finish. See locations required on plans and details.

C. Welded Steel Wire Fabric: ASTM A185 plain type; uncoated finish. Where size not noted, use 6 x 6 W2.1 x W2.1.

1. Must be flat sheets only. Coils or wire rolls are not permitted.

D. Reinforcing supports:

1. For footing, wall, pier or foundation supports use stirrups or wire meeting either CRSI Class 1-2 gauge tie wire meeting ASTM A82.
2. Slab Reinforcing Supports: Use Stirrups, chairs, masonry materials, or concrete pre-placements meeting CRSI requirements. Wood materials are prohibited. Supports are to be furnished by material supplier unless masonry or concrete preplacements. Coordinate with contractor.

2.2 ACCESSORY MATERIALS

A. Tie Wire: ASTM A82; minimum 16 gauge, annealed type, black.

B. Adhesive Anchoring Products See Section 051200 for materials to be used when rebar must be embedded into existing structures.

2.3 FABRICATION

A. Fabricate in accordance with ACI 315, providing concrete cover specified in this section.

B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

C. If required in plans or details, weld reinforcing bars in accordance with ANSI/ASW D1.4.

2.4 JOBSITE STORAGE

A. Reinforcing steel shall be stored at site on timbers or planks, not concrete, which will keep steel free from mud and water. If storage is during winter months cover and ventilate.

PART 3 – EXECUTION

3.1 INSPECTION

A. Prior to concrete placement all reinforcing shall be inspected by a Testing agency. See Section 01 45 29. This inspection shall verify that reinforcing is installed per the plans and specifications and is not contaminated with form lubricants. In case of a conflict between the plans and the submittal drawings promptly contact the Engineer for resolution.

B. When the supporting medium is a raised platform inspect the platform or decking to insure that the substrate is the proper specified platform and that the finish of the deck is as specified.

C. Prior to concrete placement, notify all required governmental authorities of the work to allow for their inspection and comment.

D. Before placing concrete, clean reinforcement of foreign particles or coatings including form oils.

If reinforcement cannot be completely cleaned, replace contaminated reinforcement.

3.2 COVERAGE

A. Maintain concrete cover around reinforcing as shown on structural plans and note sheet.

3.3 INSTALLATION

A. For slabs and exterior walkways adjacent to building if reinforcement is not shown install 6 x 6 W2.1 x W2.1 flat sheet Woven Wire Fabric. Do not use coils.

B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

C. Provide ties, bar supports and other permanent methods of keeping reinforcing steel at required position in the concrete.

1. Anchor bolts or dowels for structure above footings or foundations may be placed in the top of initial pour prior to set of that concrete pour, within 30 minutes. They must be placed correctly and have all concrete at the area of the insertion hand troweled to provide a smooth and level top of concrete surface.

2. Retaining walls, however, must have all elements including anchor bolts or dowels placed and supported in the initial pour.

D. Chair up all steel bar slab reinforcing. Do not allow reinforcing to be at bottom of slabs. The process of lifting up bars during slab pouring is not permitted unless it is to lift it up onto pins or chairs, during pour, for permanent placement.

1. Slabs where bars are not properly placed shall be replaced at contractors' expense.

E. Where smooth dowel construction joints are utilized, grease and wrap one end of the dowel.

F. See plans and details for specific locations that call for weldable reinforcing steel. At these locations use A706 reinforcing steel.

G. For drilling or placing bolts, rods, anchors or similar embedments into existing masonry or concrete whether vertical or horizontal use an adhesive anchorage system. See Section 05121 for products to use and temperature restrictions. Substrate must not be below 32^0 F.

H. For masonry see placement details for horizontal, corner and vertical bars in masonry cores, bond beams, jambs and lintels on structural drawing sheets.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED CONTRACT DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and 01 Specification Sections apply to this section.

1.2 WORK INCLUDED

A. Furnish and install all cast-in-place concrete for footings, foundations, piers, columns, exterior stoops, interior slab on grade and raised slabs, equipment pads and other work as shown on plans and details.

1. Equipment pads and similar concrete items. Division 15 and 16 contractors are responsible only for dimension, location and layout of the pads. Contractor of this section shall furnish and install concrete. If pad is located on top of a precast or other raised deck, provide information to the general contractor to adjust deck load prior to manufacturer's design of deck.

B. Protection of freshly poured and concrete undergoing curing.

C. Shelters, heat and weather protection of Cast in Place Concrete.

D. Pumping of Concrete materials if required.

E. Water stops. (See section 03 10 00).

F. Installation or metal angles, embeds and anchor bolts furnished by Division 5 into the concrete.

G. Core fill grouting of masonry (installed by mason)

H. Precast Concrete grout (installed by precast erector).

I. Precast Topping (installed by this concrete contractor).

J. Admixtures, curing compounds and accessories.

K. Sawcutting control joints.

L. ASTM and ACI standards of level and flatness.

M. Grouting of all control and construction joints with cemtitious products compatible with flooring glues prior to flooring installation.

1.3 RELATED WORK

A. Division 02- Earthwork

B. Section 03 10 00 - Concrete Forming and Accessories

C. Section 03 20 00 - Concrete Reinforcing

D. Section 04 20 00 – Masonry

E. Section 05 12 00 – Structural Steel Framing

F. Section 05 31 00 – Steel Decking

1.4 REFERENCES (Use latest publication date unless otherwise noted)

A. ACI 301 – Standard Specifications for structural concrete for buildings. (THE FIELD GUIDE)

B. ACI 315 – Details and Detailing of Concrete Reinforcement

C. ACI 318 – Building code requirements for structural concrete

D. ACI 350 – Code Requirements For Environmental Engineering Concrete Structures

E. ASTM C33 - Concrete aggregates.

F. ASTM C618 – Standard specification for coal fly ash- type C. Use Coal Creek brand of fly ash only.

G. ASTM C94 - Ready-Mixed concrete.

H. ASTM C150 - Portland cement.

I. ASTM C260 - Air-Entraining admixtures for concrete.

J. ASTM C494 - Chemical admixtures for concrete.

K. ASTM C309 – Curing compounds for concrete.

L. ACI 210-Guide to durable concrete.

M. ASTM C171- Specification for sheet material for curing concrete.

N. ASTM E1155 – Standard test method for determining (FF) Floor flatness and (FL) Floor levelness numbers.

O. ACI C308 - Standard practice for curing concrete.

P. ACI C305R – Hot weather concrete work.

Q. ACI C306R – Cold weather concrete work.

R. AASHTO M-148 for curing materials.

S. ASTM C192- Test methods for concrete.

T. ASTM C156 - Test method for moisture retention for concrete.

U. ASTM C 295 - Petrographic examination of aggregates for concrete.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Have a current copy of ACI 301 on the jobsite for reference during the work of this section.

C. Dimensions as shown on Construction Drawings are as intended. Slabs listed as 4” shall be 4".

D. If the Concrete provided does not meet these specifications, The Contractors' Independent Engineering & Testing Agency shall perform batch inspections for the design mix and shall sample and test mix ingredients until concrete quality is established to the satisfaction of these specifications.

1.6 DESIGN & TESTING

Submit the design mixes 10 days prior to placing concrete. Receive Engineers' review prior to use. Mix designs shall be no more than one-year-old from the date they are to be used. The following information shall be provided for each design mix.

(1) Fine and coarse aggregate gradations per ASTM C33.

(2) Method of determination the mix design proportions.

(3) Water/cement ratio.

(4) Entrained and non-entrained air content of freshly poured concrete.

(5) Compressive strength at 28 days per ASTM C 39.

(6) Chloride ion content of the concrete per ASTM C1218.

(7) The proportions and types of all cementitious materials and admixtures.

(8) The Shale and deleterious contents of all aggregates used.

(9) Slump. Including slump both prior and after introduction of plasticizers; if they are used.

(10) Location where concrete is to be placed. (i.e.) footings, topping etc.

B. After design mix is approved, the testing and analysis of jobsite delivered concrete will be performed under provisions of Section 01 45 23including:

1. Strength tests: 4 Cylinders (1-7day, average of 2-28 day, 1 field hold) per every 50 yards of each type of concrete for each days pour.

   a. Contractor shall keep and test additional cylinders for use in his determination of form removal timing, for cold or hot weather verification and for OSHA required column strengths.

2. Slump tests at the point of application and before and after addition of plasticizer.

Send back non-compliant trucks.

3. Air entrainment tests at same time as slump tests. Air tests in fresh concrete are intended to show current air content. Send back non-compliant trucks.

D. Vehicles on which non-compliant concrete are delivered shall not be allowed to modify concrete to be in compliance. Vehicle shall return to redi-mix plant & offload non-compliant concrete prior to batching of new concrete. No rebatched, formerly rejected concrete shall be used.

1.7 SUBMITTALS

A. Shop Drawings

1. Construction Joints: Submit drawings of proposed construction joint locations in concrete for slab-on-grade, walls and foundations. Submit any additional or changed reinforcing that is required at construction joints that differs from that shown on drawings.

2. Openings, Sleeves, and Cores: Submit drawings of all openings to be formed, sleeved, cored, or sawcut in cast-in-place elements. Drawings shall indicate size and location of openings, sleeves, or cores.

3. Embedded Items: Submit drawing showing all items to be embedded in concrete elements, including plates, angles, bolts and any non-structural items such as conduit. Drawings shall indicate locations, size, orientation and type of embedded item.

4. Anchor Rods: Submit drawings showing layout and details for steel templates used for placing anchor rods.

PART 2 – PRODUCTS

2.1 CONCRETE PROPERTIES, MATERIALS & MIXING

A. Concrete shall be plant redi-mix type meeting ASTM C94. Site mixed concrete is not acceptable.

B. Proportion mixes in accordance with ACI 211.1.

C. Compressive strength (ASTM C31) and C39): See Chart for individual requirements.

D. Water: potable, clean and free of injurious quantities of substances known to be harmful to and conforming to ASTM C94.

1. Water / cement ratio: To be calculated for each mixed design. See Chart for individual basic requirements

2. Maximum water to cement ratio for exterior concrete subject to freeze thaw cycles shall be 0.45. Use 8.32 lbs. per gallon.

E. Portland Cement: ASTM C 150, Type I / II or Type I. All shall be low Alkali. If acid resistance is needed use type II. If high early strength is required use type III or add a minimum of 47 lbs. to each mix. Each bag is 94 lbs.

1. Use the minimum quantity to reach desired 28-day compressive strength +15% overage.

F. Type C Fly Ash, meeting ASTM C618. Maximum allowable percentage and allowable time of use is stated in Chart in Article 2.6.

G. Fine aggregate: clean, durable and sound natural sand conforming to ASTM C33, #4 and down.

1. Shale or deleterious content shall be no more than .5% for slabs and 1% for all other concrete.

H. Course aggregate: clean, durable and sound natural processed gravel conforming to ASTM C33 and free or materials that can cause Alkali-silica reaction (ASR). See chart in Part 2 for maximum sizes.

1. Shale or deleterious content shall be no more than .5% for slabs and 1% for all other concrete.

2. Maximum size shall not exceed 33 1/3% of the depth of any slab section.

3. Test course aggregate for ASR under ASTM C295 or ASTM C1260.

I. Air content: Tested to ASTM C231. See chart in Part 2 for required fresh entrained quantities. All concrete has some non-entrained air.

J. Slump: Tested to ASTM C 143. See chart in Part 2 for requirements.

2.2 COMMON CONCRETE ACCESSORIES AND ADDITIVES

A. No products containing calcium chloride in a content of more than 0.06% of the cement weight in chloride ions or Thiocyanates will be permitted. See ASTM C494 and ACI 318. - **If additional admixtures are used after mix approval, notify the Structural Engineer.**

1. Use an exterior curing compound for all exterior horizontal and exposed vertical surfaces.

   Product shall meet ASTM C309 Type 2, Class B. These products leave a white Dye.

2. Clear interior cure and seal products are required for interior slab concrete, where no floor covering or coating will be applied; they must meet ASTM C1315 type 2.

   a. Verify that no floor covering or finish exists with Architect.

3. On interior slabs on grade or raised placed in an enclosed temperature controlled building where floor covering will be adhered. Use a resin type, dissipating concrete curing compound meeting AASHTO M-148, and ASTM C309 Type I Class B. Verify that product shall penetrate and not leave material on surface.

4. Wet curing materials for interior slab on grade or raised slab work where building has not been erected and concrete is exposed.

   a. Burlap, cotton mats and rags, rugs or similar material under polyethylene sheets. Fabric must not have been previously used for sugar, fertilizer or acidic materials storage. Take care that material does not have dye which will stain the concrete. The material shall meet AASHTO M-147 and ASTM C156.

   b. Combination poly and cloth sheets meeting ASTM C156.

5. Performed expansion and wall isolation joint Filler: Non extruded type joint filler constructed of asphalt impregnated fibers meeting ASTM D1751. Material shall be full depth of slab of edge joint and exposed width shall be 1/2".

6. Super plasticizer. Meeting ASTM C494F: For workability or for pumping the contractor may use a High Range Water Reducing Admixture/ or Super Plasticizer to go to a max. temporary slump of 6. Water must not be used to obtain this increase.

7. Mid Range Plasticizer. Meeting ASTM C494 Type D: Combination water reducer and agent to improve workability for concrete during placement, at a level less than a superplasticizer.

8. Water reducing admixtures: Water reducing admixtures meet ASTM C494, Type A.

9. Air Entraining: Tests to ASTM C231. Air content is shown on chart in Part 2 for individual types of concrete. Air entraining products must meet ASTM C260. All concrete does have some non-entrained air.

   a. Adjust if using a super or midrange plasticizer.

10. Concrete Bonding Agents: If concrete is to be placed on top of existing concrete or masonry use products meeting ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

11. Non-Chloride Accelerating Admixtures: If a faster initial set up is desired, or is specified in chart, use products meeting ASTM C 494 Type C. Never use chlorides.

2.3 GROUT FOR STRUCTURAL METAL BASEPLATES AND DOWELS

A. See Section 05 12 00 for non-shrink non-metallic grout.

B. Grout for dowels, See section 05 12 00 for adhesive anchoring systems.

2.4 GROUT FOR INTERIOR CONTROL JOINT, COLD JOINTS, CRACKS OR EXPANSION JOINT FILLING

A. Fill All Control Joints, construction joints and cracks over 1/16" in width except exterior required to prior to flooring or colorant installation

1. Use a cementitious thin patch that can be applied from featheredge to 1”inch thick. Products must contain at least 80% ASTM C150 cementitious materials. Product shall self-bonding to clean dry concrete and meet ASTM C1157 performance and ASTM C191 for material set characteristics. Some of these require flooring glues to be applied within 24 hours.

2.5 CONCRETE MIXING AND TRANSPORTING

A. Do not add water to concrete at the site except with the direct written approval of the Structural Engineer or Architect. Delivery trucks shall deliver with minimum drum revolutions. No concrete older than 90 minutes from time of mixing in the truck shall be used for the project. See Article 1.6 on non-complaint concrete trucks.

2.6 CONCRETE MATERIALS, TYPES, STRENGTHS AND ADDITIVES

A. Install mixes that provide following minimum requirements:

1. Concrete design mixes shall have a min. 15% over-design of compressive strength.

3. Type C fly ash from Coal Creek Station in Stanton, North Dakota may be used up to the maximum percentages shown in non-cold weather conditions. Do not use fly ash within 48 hours prior to or 72 hours after an air temperature of 50 degrees or lower exists. Do not use from November 1st till April 15th where concrete is not in a 28-day environment where the temperature is kept above 50O. Fly ash will retard initial set.

- **Footings & Footing Pads**
  - Low Alkali Cementitious Product Types: Portland Type I or I/II; Maximum 25% Fly Ash Allowed
  - Maximum Aggregate Size: 1½”
  - Max Slump: 5”
  - 28 Day Compressive Strength: 3,000psi
  - Max w/c Ratio 0.55
  - Allowed Admixtures; Air Entrainment WRDA Series upon Approval; Use of Entrained Air is Contractors Option

- **Foundation Walls, Columns, Piers, Grade Beams (<u>IF NOT</u> Exposed to Weather)**
  - Low Alkali Cementitious Product Types: Portland Type I or I/II; Maximum 20% Fly Ash Allowed
  - Maximum Aggregate Size: ¾”
  - Max Slump: 4”
  - 28 Day Compressive Strength: 4,000psi
  - Max w/c Ratio 0.53
  - Allowed Admixtures; Air Entrainment WRDA Series upon Approval; Mid-Range Plasticizer With Prior Approval; Use of Entrained Air is Contractors Option

- **Foundation Walls, Columns, Piers, Grade Beams (<u>IF</u> Exposed to Weather)**
  - Low Alkali Cementitious Product Types: Portland Type I or I/II; Maximum 20% Fly Ash Allowed
  - Maximum Aggregate Size: ¾”
  - Max Slump: 4”
  - 28 Day Compressive Strength: 4,000psi
  - Max w/c Ratio 0.45
  - Allowed Admixtures; Air Entrainment WRDA Series upon Approval; Mid-Range Plasticizer OK

Super Plasticizer With Prior Approval
5%-7% Entrained Air

- **Interior Slabs on Grade**
  - Low Alkali Cementitious Product Types: Portland Type I or I/II
    Maximum 20% Fly Ash Allowed (Will Retard Initial Set)
  - Maximum Aggregate Size: ¾”
  - Max Slump: 5”
  - 28 Day Compressive Strength: 4,000psi
  - Max w/c Ratio 0.45
  - Allowed Admixtures; Air Entrainment WRDA Series upon Approval
    Mid-Range Plasticizer With Prior Approval
    Super Plasticizer With Prior Approval
    5% Entrained Air is Contractors Option

- **Exterior Horizontal Concrete on Grade**
  - Low Alkali Cementitious Product Types: Portland Type I or I/II
    Maximum 25% Fly Ash Allowed
    Use min. 564 Lbs. of Cementitious Materials
  - Maximum Aggregate Size: ¾”
  - Max Slump: 4”
  - 28 Day Compressive Strength: 4,000psi
  - Max w/c Ratio 0.44
  - Allowed Admixtures; Air Entrainment WRDA Series upon Approval
    Mid-Range Plasticizer OK
    Super Plasticizer With Prior Approval
    5%-7% Entrained Air

2.7 RELATED PRODUCTS

A. Post-Installed Anchors.

1. Mechanical Anchors: Only anchors having passed Acceptance Criteria 193 for use in cracked concrete and resisting wind and seismic loads shall be approved for use. Reports from the following organizations are acceptable:
   a. ICC Evaluation Service Report.
   b. IAPMO Uniform Evaluation Services.
2. Adhesive Anchoring Systems: Only adhesive anchor systems that comply with the latest revision of ICC-ES Acceptance Criteria 308 for use in cracked concrete and resisting wind and seismic loads shall be approved for use. Reports from the following organizations are acceptable:
   a. ICC Evaluation Service Report.
   b. IAPMO Uniform Evaluation Services.
3. Cold Weather Placement: See ACI 306R

B. Anchor Rods:

1. ASTM F1554, Grade 36

C. Non-Shrink Grout:

1. Type: Grout for base plates, bearing plates and grouting under precast or tilt-up wall panels shall be a non-metallic, shrinkage resistant, premixed, non-corrosive, non-staining product containing Portland cement, silica sands, shrinkage compensating agents and fluidity improving compounds.
2. Specifications: Non-shrink grout shall conform to ASTM C 1107.
3. Compressive Strength: Provide the minimum strength as shown below as determined by grout cube tests at 28 days:
   a. 6,000 PSI for supporting concrete 3,000 PSI and less.

b. 8,000 PSI for supporting concrete greater than 3,000 PSI and less than or equal to 4,000 PSI.

c. Unless noted otherwise on the drawings, grout strength on supporting concrete greater than 4,000 PSI shall be 8,000 PSI.

PART 3 – EXECUTION

3.1 INSPECTION AND PROTECTION

A. Notify Engineer minimum 24 hours prior to commencement of concrete placement.

B. Verify anchors, seats, plates, reinforcement, drains and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete. Provide written verification as well as photographs of the area to be poured.

C. Insure polyurethane waterstops have been installed for at least 3 hours prior to pour and that rigid waterstop types are continually supported.

D. Work area and Concrete may be exposed to potentially hazardous damage after initial set has been achieved. Take measures to protect concrete from traffic, ladders, fluids and indentation during initial set and curing. Ladders and all materials with sharp edges must have protective plywood under the rungs or edges.

3.2 PREPARATION

A. Prepare existing concrete or masonry, for additional concrete by cleaning with steel brush and a neutral pH cleaning solution to insure removal of existing solvents, greases, plant products and other solutions. Apply an ASTM C1059 bonding agent in accordance with manufacturer's instructions.

B. If concrete is to be placed on top of metal platforms, or decks, prepare metal surface by cleaning with an acid etching solution or vinegar. Do not place concrete if rust or oxidation is present. Notify Architect.

C. If concrete is a slab to be placed on top of soil, insure that the soil is well compacted to specifications shown in earthwork section and that no debris or organic materials are present. Dampen the surface with water but do not flood.

D. At any location where new concrete is doweled to existing work, use an adhesive anchoring system. See section 05 12 00.

E. Protect and tape over all surfaces to be exposed, of all floor drains, openings and devices to be set into the concrete.

F. Protect all concrete from freezing during placement and initial set. Under no circumstances can concrete be placed on top of frozen soil, snow, ice, and frozen precast or any other frozen object.

3.3 VAPOR RETARDER

A. For all interior Slab on Grade Concrete with flooring or a finish applied; A vapor retarder shall be placed directly above granular subbase.

B. Use screed bars and platforms and means / methods keep vapor retarder unbroken.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 301. Keep an ACI 301 book on site for reference at all times.

1. Do not allow a vertical drop of more than 5'-0" without use of a Tremie to prevent aggregate segregation.
2. Hot Weather Placement: See ACI 305R
3. Cold Weather Placement: See ACI 306R

B. Ensure reinforcement, inserts, embedded parts, drains and formed joints are not disturbed during concrete placement. If movement occurs the concrete contractor must remove and replace the effected item and the effected concrete.

C. See section 03 20 00 and structural notes sheet for minimum concrete cover.

D. Use a minimum 1/8" per foot slope for all floor drains. Pitch entire room slab or maximum

area of 20'- 0" and increase to 1/4" per foot of pitch in final 4'-0" of space around the drain. The concrete shall be worked well around all surfaces of the drain fitting.

E. All slab reinforcing must be on chairs. Hand lifting without supports during pour is prohibited.

F. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours that would cause new cold joints to occur.

G. Excessive honeycombing or embedded debris in concrete is not acceptable. Contractor must replace or repair. See section 03 10 00, Part 3 for acceptable finishes.

H. Concrete may be placed by means of a Concrete pumper. A plasticizer and a decrease in course aggregate size may be used only with permission of the Engineer when pumping is used. Cementitious content will need to be raised if aggregate size is modified. See requirements on slump and super plasticizer in Part 2.

I. The concrete shall be screeded or struck off slightly above final elevation, then consolidated.

1. Consolidate concrete by vibrating, so that concrete is thoroughly worked around reinforcement, around embedded items and into corners of forms to eliminate air or stone packers that may cause honeycombing, pitting or weakness.

a. Vibrating shall be done by experienced workers in a manner to eliminate consolidation. Do not vibrate forms or reinforcing materials.

2. After consolidation the concrete shall not be further worked until finishing.

J. Do not add water during placement or when finishing.

K. Depth or thickness of concrete is to be as shown on the plans. No variation in thickness or depth is allowed.

1. Slab concrete that is shown as 4 inches shall not be formed and poured at 3 5/8".

L. Do not use cement or sand to take up excess surface water.

3.5 HORIZONTAL SURFACE FINISHING (Including interior & exterior floors)

A. Finish the concrete when the water sheen has disappeared and the surface has stiffened enough to permit the finishing operation. Follow ACI 302.1R.

B. Types of final finishes are:

1. For all interior flat exposed, resilient tile, or thin set ceramic tile covered floors float and then "Hard Steel Trowel Finish" the concrete surface in accordance with finishing class 5. This is designed to provide a smooth floor. Provide very close surface tolerances and no telegraphing of cementitious surfaces into the tile.

a. Use the same finish for carpet covered floors.

2. For all interior floors that will have ceramic or material requiring a grout bed provide only a floated finish with a wood float surface that allows for a level but not perfectly smooth surface. Considered a class 1,2 or 3 surface, but without any final troweling.

3. For all interior concrete that contains air entrainment of 3% or less, an aluminum or magnesium float followed by a "Hard Steel Trowel Finish" shall be applied. Class 2.

4. For all exterior concrete that contains air entrainment, an aluminum or magnesium float followed by a "Light Soft Bristle Broom Finish" shall be applied.

5. For all interior concrete that requires slip resistance, an aluminum or magnesium float, followed by minimal steel trowling for levelness and a "Light Soft Bristle Broom Finish" shall be applied.

6. See ACI 302.1R for class 6 and higher floors that are impact, high traffic or super flat.

B. All concrete horizontal surfaces, including floors must be flat and level. The following chart shows ASTM E1155 values in an average commercial situation for a flat and level floor that shall be followed:

1. F_F defines the maximum floor curvature allowed over successive 24" measurements

on a 20'-0" x 20'-0" floor or flat surface. It is concerned with floor waviness.

2. F_L defines the maximum difference in elevations in decimals of an inch, between two points separated by 10'-0" taken any place on the floor. It is concerned with local levelness.
3. The specified overall numbers are the maximum obtainable.
4. The minimum localized numbers are the required expected values for the test section.

C. A traditional method to determine floor flat and levelness is to place a 10'-0" flat level anywhere on the surface. No more than a 3/16" gap would be measured under the level at any place on the floor or interior or exterior surface. In the chart we have listed this traditional measurement ***as a guide only.***

D. The ASTM system is designed to measure 4 20' x 20' test sections randomly chosen on the floor or surface in question. The Sections should not adjoin each other unless the floor is less than 80'x 80' in size.

Types of concrete Horizontal surfaces & Their Quality Classifications	Minimum FF / FL Numbers Required			Local Levelness Value	Maximum Clearance Under a 10' Level
	Overall Flatness Value	Local Flatness Value	Overall Levelness Value		
Flat concrete base for grout bed	20	15	15	10	3/8"
Precast Topping Surface	30	20	15	10	3/16"
Raised Slab Surface	30	20	15	10	3/16"
Interior Slab on Grade surface	35	24	30	20	1 / 8"
Exterior & garage floors, stoops, paving surfaces	20	15	13	10	1 / 4"

3.6 CRACKS, EXPANSION, CONSTRUCTION, AND CONTRACTION JOINTS

A. Horizontal and vertical construction joints in concrete shall be made only where shown for structural drawings and or approved by Engineer. All cold construction joints shall be provided with a suitable bonding agent at all grooves and keyways, and surfaces against which new concrete is to be laid shall be thoroughly cleaned with a stiff wire brush and water.

1. Where smooth dowel construction (cold) joints are used, grease and wrap the exposed end of the dowel to allow horizontal movement.

B. Expansion joints at edges of the building or bay shall be filled with expansion material to within ¾" of top of all adjacent slabs or edges and shall be located where shown on drawings. See Part 2 products for types of materials to use.

C. Control joints shall be saw cut and located as shown on structural drawings. If not shown cut at intervals of (36 x slab thickness)" by (36 x slab thickness)" (+/- 5'-0"). Locate under wall partitions if possible.

1. Saw cut control joints at an optimum time after finishing. Use 3/16-inch thick blade, cutting at least 1/4 into depth of slab thickness. (i.e.) 4" slab to be cut 1"+ deep. Fill saw cut control joint with a semi rigid joint filler, in accordance with ACI301, section 11.3.9. General Contractor is responsible for joint and semi rigid joint filler condition up to 90 days after building is occupied. After the 90 days, owner is responsible for joint maintenance.

D. All exposed joints and cracks over 1/16" in interior concrete upon which flooring or colorants are to be applied shall be grouted solid with a cementitious grout acceptable to flooring glue

manufacturer. Contractor shall install prior to flooring installation but after initial cracking and movement due to shrinkage is complete. Generally 28 days. See part 2 products for material to use. Coordinate with flooring work. Some products have a limited time for installation of flooring.

1. All joints that are under walls or partitions or are unexposed shall be sealed with a semi rigid joint filler, in accordance with ACI 301, section 11.3.9.

3.7 CONCRETE CURING AND SEALING (See also ACI 308)

A. All interior and exterior concrete must be kept between 55 and 80 degrees F and in a moist condition, to decrease water evaporation from the exposed surfaces during the first 7 days after placement.

1. For building or shelter-enclosed concrete, Contractor may use temporary heaters provided that he vent all flue gases from units to the outside of the enclosure. Use only fresh outside air for combustion. All heaters of this type must also be equipped with a heat exchanger vented to the outside.

B. All interior slabs receiving glued down flooring, either on grade or raised, that are enclosed by the building shall be kept between 55^{O} and 80^{O} F and cured in the following manner.

1. Either use the method in Paragraph C.1. below or:
2. After finish troweling apply a resin based dissipating cure product meeting ASTM C309 with no surface residue in a double cross coat application. This will provide moisture retention only. Keep foot and equipment traffic off the slab for 7 days. Use products that do not leave residue on slab surface. See Part 2 Products.
3. **Do not apply to concrete that will have colorant or exposed aggregate.**

C. All interior slabs, receiving glued down flooding either on grade or raised **that are exposed to weather and not enclosed** by the building during concrete pour and cure shall be kept between 55^{O} and 80^{O} F and cured in the following manner.

1. Cover the slab with wet, non-ink containing burlap or similar material, under a 4-mil thick polyethylene plastic sheeting or a combination burlap / polyethylene cloth to retain moisture. Keep burlap or similar material moist and the slab cured in this manner for 7 days at a temperature range of 55 to 70 degrees F.
2. Install materials to hold down the material.
3. If high early strength, Type III, concrete is used and temperature is kept above 73 degrees the period of time of wet curing required may be reduced to 3 days.

D. Allow the surface of the concrete to further cure and dry for a period of 28 days prior to exposure to epoxy finishes, flooring glues, hard surface traffic, steel wheels or shovels.

E. All exterior exposed uncolored vertical or horizontal concrete shall have a white dye release curing compound meeting ASTM C309 Type 2 applied.

1. See Part 2 Products and follow manufacturer recommendations & limitations for their use.

F. All interior slabs, left uncovered and not receiving any finish, colorant or flooring, either on grade or raised shall have a curing and sealing compound meeting either ASTM C1315 Type 1 or C309 Type 1applied.

1. See Part 2 Products for type and Architectural Plans for locations.

G. ***Interior athletic or vehicle traffic*** use uncolored or covered concrete slabs shall have an exterior cure and seal compound meeting ASTM C1315 Type 2 applied. See Part 2 Products for type and Architectural Plans for locations.

3.8 GROUTING OF CORES IN MASONRY UNITS

A. Fill all cells containing reinforcing with grout once masonry units have reached sufficient strength to resist grout pressure.

1. Grout masonry units in a height that allows full access to each lift's cores. Generally no more than 4’-0” in height each lift.
2. If core fill grout is to be placed in more than one lift, depress level of grout in first row of cells by 2” inches to insure an adequate bond on the following upper masonry layer.
3. At the top surface of the masonry stack bond, strike off any excess material above the surface.
4. At the top surface of the masonry stack bond, strike off any excess material above the surface.

B. Keep cells to be filled clean.

C. Center metal bars and dowels in the cells.

D. Vibrate if necessary to ensure grout has reached entire depth of cell.

3.9 SETTING AND GROUTING OF STRUCTURAL METALS AND BASEPLATES

A. See section 05 12 00.

B. Setting of anchor bolts is by this 03 30 00 Section using template, Contract Drawings and reviewed shop drawings from Section 05 12 00.

3.10 TOPPING CONCRETE

A. Install after all precast is set, all welding is complete and grouting is cured and reached its 28-day strength. (Topping is supplied and installed by this concrete contractor)

3.11 GROUTING OF PRECAST CONCRETE UNITS (Grout is installed by precast erector)

A. After all erection, bolting and welding of precast units and placement of reinforcing is completed, grout shall be placed. All edges of plank, columns or beams and all metal supports connections or embedments must be grouted full and shall match the level of the adjacent surface. (Grout is supplied and installed by the precast erector.)

1. See heating and covering requirements in 03 41 00 any time temperature of air is below 55F.
2. During summer comply with hot weather precautions stated in ACI 305R.

3.12 FOOTING & FOUNDATION CONCRETE

A. Do not use earth forms for footings.

B. Insure that all forms are braced sufficiently to handle weight and shifting from pouring of concrete.

C. Have an inspection done of all footings prior to pouring this concrete. Correct any reinforcement or form deficiencies prior to pouring. Do not imbed horizontal or cross bracing reinforcing after concrete has been poured. Dowels may be set after pouring but must be placed while concrete is still wet and pliable not after initial set. Drilling in dowels after set is not acceptable.

D. Use vibration to insure that all concrete is solidly placed and that no voids or honeycombs are allowed to occur.

E. Insure that top of footing concrete is level and able to receive masonry or concrete foundations without excessive dips or void areas.

F. Keep forms in place until the concrete is sufficiently strong enough to avoid deflection. See Section 031000.

G. During backfilling operations, brace foundation walls to prevent flexural distortion in curing concrete.

3.13 EXTERIOR CONCRETE

A. Insure that surface is not frozen on which concrete is to be poured. Protect finished product from freezing temperatures. See ACI 306 R.

B. If concrete is placed in hot weather in temperature above 80 degrees, provide protection to all newly poured surfaces. See ACI 305R.

C. Keep traffic off concrete until 75% of minimum required strength is attained by test.

D. Follow ADA and local governmental requirements with regard to maintaining proper slope at pedestrian walkways.

E. Provide a gradual slope to catch basins, drains and similar.

F. Provide rounded surface to all edges of walks, drives or other horizontal concrete during finishing. Provide a light broom finish to all horizontal exposed surfaces.

G. See Part 3 horizontal surface finishing for methods of curing and finishing exterior surfaces.

3.14 DEFECTIVE CONCRETE (See Chapter 9 of ACI 301)

A. Modify or replace concrete not conforming to required levels and lines, thickness, details, and elevations.

B. Repair or replace concrete not properly placed, indented or damaged, not of the specified type, frozen, spalling, under strength by more than 15%, or improperly cured. Testing agency that designed concrete, Engineer and Architect shall be final arbiters of quality.

3.15 FIELD QUALITY CONTROL

A. See Division 01 and Part 1 of this specification

3.16 CLEANUP

A. At completion of each day's work, remove all concrete spillage and splash from adjacent areas and work.

1. If Glass has been effected carefully, remove particles using methods approved by the glazing manufacturer. Do not use products that could etch glass.
2. Provide a disposal place for ready mix truck wash down. Do not allow wash down concrete to be deposited in the street, on finished landscaping or onto other work. Costs of cleanup of improperly disposed of wash down will be deducted from future payment and will include replacement of damaged or soiled property.

END OF SECTION

SECTION 044313
STONE MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Anchored cut stone veneer at exterior walls.

B. Metal anchors and accessories for anchored veneer.

C. Setting mortar and pointing mortar.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.

B. Section 076200 - Sheet Metal Flashing and Trim: Flashings.

C. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

B. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2019.

C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM C119 - Standard Terminology Relating to Dimension Stone; 2026.

F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2026.

G. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2022.

H. ASTM C616/C616M - Standard Specification for Quartz-Based Dimension Stone; 2022.

I. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2022a.

J. ASTM C1515 - Standard Guide for Cleaning of Exterior Dimension Stone, Vertical And Horizontal Surfaces, New or Existing; 2020.

K. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on stone units, mortar, and reinforcement.

C. Samples: Submit two stone samples illustrating color range, texture, and markings.

D. Samples: Submit mortar color samples.

E. Stone Fabricator's Qualification Statement.

F. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum five years of documented experience.

1.07 MOCK-UP

A. Construct stone wall mock-up, 4 feet long by 4 feet wide; include stone anchor accessories, sill and head flashings, corner condition, and typical control joint in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect stone from discoloration during storage on site.

B. Provide ventilation to prevent condensation from forming on stone.

1.09 FIELD CONDITIONS

A. Maintain materials and ambient air at minimum of 40 degrees F (5 degrees C) prior to, during, and for 48 hours after completion of work.

PART 2 PRODUCTS

2.01 STONE

A. Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.
   1. Pattern: 3 height coursed ashler for honed field stone. Single height coursed ashler for splitface banding.
   2. Heights: Varies from 3" - 11".
   3. Length: 18".
   4. Depth: 2-1/2"
   5. Colors: Silver Shadow.
   6. Grain Direction: Vertical.
   7. Surface Finish: Honed 120 Grit; as described in ASTM C119.
   8. Surface Finish: Heavy Tapestry.
   9. Basis of Design: Vetter Stone, www.vetterstone.com
      a. Alabama Stone Co; Veneer: www.alabamastone.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.02 MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Dash Bond Coat: One part Portland cement, with maximum two parts sand.

D. Setting Bed Mortars: Setting bed used to adhere stone veneer units to scratch coat mortar or to bondable concrete or concrete masonry.
   1. Site-Mixed: ASTM C270, Type S, using the Proportion Method as specified in Section 040511.
   2. Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.

E. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual stone veneer units once the setting bed mortar has sufficiently cured.
   1. Site-Mixed: ASTM C270, Type N or Type S, using the Proportion Method as specified in Section 040511.
   2. Prepackaged/Preblended: ASTM C1714/C1714M, Type N or Type S.

2.03 ACCESSORIES - ANCHORED VENEER

A. Horizontal Joint Reinforcement: Ladder type; stainless steel wire complying with ASTM A580/A580M Type 304, 3/16 inch diameter side rods with 0.1483 inch diameter cross ties.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com/#sle.
      b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Wall Ties: Formed steel wire, stainless steel complying with ASTM A580/A580M, eye and pintle type and wall strap for screw attachment to studs, with provision for vertical adjustment after attachment.

C. Other Anchors in Direct Contact with Stone: ASTM A666 Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.

D. Setting Buttons and Shims: Plastic.

E. Flashings: See Section 042000.

F. Weep/Cavity Vents: Rope.

G. Back Coating:

H. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.04 STONE FABRICATION - ANCHORED VENEER

A. Pattern and Coursing: see drawings.

B. Fabricate for 3/8 inch beds and joints.

C. Bed and Joint Surfaces:
   1. Cut or sawn full square for full thickness of unit.

D. Backs: Sawn.

E. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

F. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.

G. Cut drip slot in bottom surface of work projecting more than 1/2 inch over openings. Size slot not less than 3/8 inch wide and 1/4 inch deep for full width of projection.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support work and site conditions are ready to receive work of this section.

B. Verify that items built-in under other sections are properly located and sized.

3.02 PREPARATION - ANCHORED VENEER

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean stone prior to installation. Do not use wire brushes or implements that mark or damage exposed surfaces.

C. Clean sawn surfaces of rust stains and iron particles.

D. Coat back surfaces not to be in contact with setting mortar with back coating material. Allow coating to cure.

3.03 INSTALLATION - ANCHORED VENEER

A. Install flashings of longest practical length and seal watertight to back-up. Lap end joints minimum 6 inches and seal watertight.

B. Cut stone at site to produce clean faces.

C. Size stone units to fit opening dimensions and perimeter conditions.

D. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.

E. Arrange stone pattern to provide color uniformity and minimize visual variations , and provide a uniform blend of stone unit sizes.

F. Fill dowel holes in stone units with mortar.

G. Arrange stone coursing in running bond with consistent joint width.

H. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

I. Install weep/cavity vents in vertical stone joints at 36 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

3.04 REINFORCEMENT AND ANCHORAGE - ANCHORED VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place horizontal joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Attach wall ties to back-up to bond veneer to back-up at maximum 16 inches on center vertically and 36 inches on center horizontally.

F. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

3.05 JOINTS - ANCHORED VENEER

A. Leave the following joints open for sealant; see Section 079200:
   1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   2. Joints in projecting units.
   3. Joints between rigidly anchored units, including soffits, panels, and column covers.
   4. Joints below lugged sills and stair treads.
   5. Joints below ledge and relieving angles.
   6. Joints labeled "expansion joint".

B. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.

C. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.

D. At joints to be sealed, clean mortar out of joint before it sets. Brush joints clean.

3.06 INSTALLATION - MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.

C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.07 CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

B. Discontinue lath, scratch coat, and setting bed at movement joints in adhered veneer.

3.08 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.09 CLEANING

A. Remove excess mortar as work progresses, and upon completion of work.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Clean exterior stone per ASTM C1515.

E. Use non-metallic tools in cleaning operations.

3.10 PROTECTION

A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION

SECTION 047200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including wall caps, coping, and sills.

1.02 RELATED REQUIREMENTS

A. Section 044313-Stone Masonry Veneer: Installation of cast stone in conjunction with masonry.

B. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2026.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

E. Full-Size Samples, For Review:
   1. Basic Shapes: One of each.

F. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.

2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 MOCK-UPS

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. See Section 014000 - Quality Requirements for additional requirements.

C. Approved mock-up will become standard for appearance and workmanship.

D. Mock-up may remain as part of the completed work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Marcstone, www.marcstone.com.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Basis of Design Color: Marcstone 6404 - Dark Shale.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.
   1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Units: Type I, white or gray as required to match Architect 's sample.
   2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Mortar: Portland cement-lime, as specified in Section 040511 ; do not use masonry cement.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mechanically anchor each cast stone unit.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing.
   2. Remove excess mortar from face of stone before pointing joints.
   3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
   4. Leave the following joints open for sealant:
      a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
      b. Joints in projecting units.
      c. Joints between rigidly anchored units, including soffits, panels, and column covers.
      d. Joints below lugged sills and stair treads.
      e. Joints below ledge and relieving angles.
      f. Joints labeled "expansion joint".

B. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
1. Wet surfaces with water before applying cleaner.
2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
3. Remove cleaner promptly by rinsing thoroughly with clear water.
4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members.

B. Base plates, expansion joint plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2023.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.

F. ASTM A514/A514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2005 (Reapproved 2009).

G. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011.

H. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2013.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

1.04 SUBMITTALS

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

B. Shop Drawings: Submit drawings showing complete details and schedules for fabrication and assembly of structural steel members. Drawings shall include the following minimum information:
   1. Details of cuts, connections, camber, holes, and other pertinent data.
   2. Indication of welds by standard AWS symbols, and show size, length, and type of each weld.
   3. Indication of type, size, and length of bolts, distinguishing between shop and field bolts. Identify the type of high-strength bolted connection (slip-critical, direct-tension, or bearing connections). Indicate locations of pretensioned bolts.
   4. Connection material specification and sizes.
   5. Joints or groups of joints in which a specific assembly order, welding sequence, welding technique, or other special precautions are required.
   6. Holes, flange cuts, slots, and openings shall be made as required by the structural drawings, all of which shall be properly located by means of templates.
   7. Setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed by others.
   8. Non-Destructive Testing (NDT) to be performed by the Fabricator, if any.
   9. A letter sealed by the Fabricator’s Professional Engineer responsible for the design of any of the connections shown on the shop drawings attesting that the engineer has reviewed the shop drawings and that the connections detailed and shown on the shop drawings conform to the engineer’s design.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

E. Erection-Bracing Drawings: Submit, for record purposes only, complete erection-bracing drawings.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Fabricator: The structural steel fabricator shall have not less than 5 years of experience in the successful fabrication of structural steel similar to this project.

C. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

C. Square and Rectangular HSS: ASTM A500, Grade C (Fy=50 ksi)

D. Steel Plate: ASTM A514/A514M.

E. Structural Bolts and Nuts: ASTM F 3125 Grade A325 Type 1 or ASTM F 3125 Grade A490 Type 1

F. Headed Studs used as Anchors for Structural Steel Plates and Members connecting to Concrete: AWS Type A studs manufactured in conformance with ASTM A 29 with a minimum tensile strength of 61,000 psi of sizes as specified on the drawings.

G. Headed Studs used as Composite Member Shear Connectors: AWS type B studs manufactured in conformance with ASTM A 29 with a minimum tensile strength of 65,000 psi of sizes as specified on the drawings.

H. All anchor rods shall conform to ASTM F 1554. unless noted otherwise on the drawings and shall be of the yield strength Grade 36. Substitution for Grade 36 anchor rods with Grade 55 anchor rods shall only be permitted provided the Grade 55 anchor rods comply with Supplementary requirements S1 of ASTM F 1554.

I. Welding Materials: AWS D1.1; type required for materials being welded.

J. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi (48 MPa) at 28 days.

K. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Camber of structural steel members is indicated on the drawings. Camber shall be measured in the Fabricator’s shop in the unstressed condition, prior to erection. The Fabricator shall provide camber measurements of all beams and a report to the Testing Laboratory confirming this has been done. Where possible, camber of beams shall be applied by a cold bend process.

E. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work. Furnish 1/8" minimum steel templates for presetting bolts and other anchors to accurate locations.

2.03 CONNECTIONS

A. The Fabricator’s detailer shall complete connection detailing using predesigned connections taken directly from the AISC “Steel Construction Manual”.

2.04 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

B. Coordinate all shop painting of structural steel with Architect's painting requirements as specified on the architectural drawings and in the specifications. The Fabricator shall be responsible for determining all painting requirements (which surfaces are to be painted or left unpainted) on the project prior to fabrication.

C. All structural steel items and their connections permanently exposed to exterior conditions or that are within areas of unconditioned airspace, whether specified on the drawings or not, shall be hot-dip galvanized after fabrication unless indicated on the drawings or in Specification to receive a primer and/or finish coat.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. The Erector shall design and provide all required temporary shoring and bracing to hold structural framing securely in position and to safely withstand all loads as specified in the Code of Standard Practice and ASCE 37 unless larger loads are required by the local building code or specified herein. Provide all bracing, any additional structural members, and increase member sizes and/or connections shown on the drawings as required to accommodate the erection loads, methods, sequence of erection, and equipment until the lateral-load resisting or stability-providing system is completely installed. Clearly show all temporary supports and modifications to designed members on the Shop Drawings and the Erection-bracing Drawings. A qualified licensed professional engineer, hired by the Erector, shall design the temporary shoring and bracing and shall seal the erection-bracing drawings.

D. Initial Survey: Check elevations of concrete and masonry bearing surfaces, anchor bolt locations, embedded connection plates, and all dimensions of existing structures to which new connections are to be made prior to erection and submit any discrepancies to the Engineer prior to the start of erection. Corrections or compensating adjustments to the structural steel shall be made and approved prior to the start of erection.

3.03 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4523.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Non-structural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Roofing nailers.
F. Roofing cant strips.
G. Preservative treated wood materials.
H. Miscellaneous framing and sheathing.
I. Communications and electrical room mounting boards.
J. Concealed wood blocking, nailers, and supports.
K. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 033000 - Cast-in-Place Concrete: Setting anchors in concrete.
C. Section 055000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
D. Section 061500 - Wood Decking.
E. Section 061753 - Shop-Fabricated Wood Trusses.
F. Section 061800 - Glued-Laminated Construction.
G. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
H. Section 076200 - Sheet Metal Flashing and Trim: Sill flashings.
I. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
D. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. PS 2 - Performance Standard for Wood Structural Panels; 2019.
I. PS 20 - American Softwood Lumber Standard; 2025.
J. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials, application instructions, and dimension lumber.

C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 6by6 inch in size illustrating wood grain, color, and general appearance.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Lumber: Comply with PS-20 and approved grading rules and inspection agencies.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 EXPOSED DIMENSION LUMBER

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Sizes: Nominal sizes as indicated on drawings.

C. Surfacing: S4S.

D. Moisture Content: S-dry or MC19.

2.04 STRUCTURAL COMPOSITE LUMBER

A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
   1. Columns: See structural drawings.
   2. Beams: See structural drawings.
   3. Headers: See structural drawings.
   4. Manufacturers:
      a. Boise Cascade Company: www.bc.com/#sle.
      b. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

2.05 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: S-dry (19 percent maximum).

C. Surfacing: S4S.

2.06 CONSTRUCTION PANELS

A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exterior, Exposure 1.
   2. Grade: Sheathing.
   3. Span Rating: 32/16.
   4. Performance Category: 1/2 PERF CAT.

B. Wall Sheathing, For shear walls: Any PS 2 type.
   1. Bond Classification: Exterior, Exposure 1.
   2. Grade: Sheathing.
   3. Span Rating: 24/16.
   4. Performance Category: 7/16 PERF CAT.

C. Wall Sheathing, For non-shear walls: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
   1. Edges: Square.
   2. Manufacturers:
      a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.
      b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

E. Other Applications:

1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Other Locations: PS 1, C-D Plugged or better.
4. Backing for adult changing table: 1" thick marine grade plywood, anchored every 6".

2.07 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

D. Water-Resistive Barrier: As specified in Section 072500.

2.08 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Manufacturers:
      a. Lonza Group: www.wolmanizedwood.com/#sle.
      b. Koppers Performance Chemicals, Inc; ____: www.koppersperformancechemicals.com/#sle.
      c. Viance, LLC: www.treatedwood.com.
      d. Osmose, Inc: www.osmose.com.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing or flashing.
      d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges use sheathing clips where joints occur between roof framing members.
2. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

3.09 CLEANING

A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061500
WOOD DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Softwood lumber structural wood decking.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Bearing support.

B. Section 099000 - Painting and Coating: Field finishing.

1.03 REFERENCE STANDARDS

A. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection; 2005.

B. ASTM D143 - Standard Test Methods for Small Clear Specimens of Timber; 2025.

C. ASTM D198 - Standard Test Methods of Static Tests of Lumber in Structural Sizes; 2022a.

D. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials; 2020 (Reapproved 2025).

E. AWC WCD2 - Tongue and Groove Roof Decking; 2003.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. PS 20 - American Softwood Lumber Standard; 2025.

H. SPIB (GR) - Standard Grading Rules; 2021.

1.04 SYSTEM DESCRIPTION

A. Design roof live and dead load per drawings with deflection limited to 1/360 of span.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

C. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

D. Samples of Wood Deck Exposed To View: Submit two samples, 12 x 36 inch in size illustrating wood grain, stain, and finish.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of South Dakota.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least three years of experience and certified by AITC.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with at least three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glue laminated members in accordance with AITC 111 requirements for individually wrapped material.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tongue and Groove Decking:
   1. Basis of Design: Disdero Lumber Co.; Lock Deck.
   2. Boise Cascade Company: www.bc.com/#sle.
   3. Georgia-Pacific LLC: www.buildgp.com/#sle.
   4. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

A. Hidden Fastener Deck Board Clips: Fabricated from glass-fiber-reinforced nylon 6/6; configured to fit grooved wood deck boards, and to allow board expansion and contraction.

B. Products:
   1. Nova USA Wood Products; ExoDek QuickClip: www.novausawood.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.03 WOOD MATERIALS

A. Timber Tongue and Groove Roof Decking: Comply with AWC WCD2 .

B. Lumber Decking: Fabricated to AWC WCD2.
   1. Species: Douglas Fir/Larch, graded under SPIB (GR) rules as AITC Select quality.
   2. Size: 3 by 6 inches, nominal.
   3. Pattern: AITC standard beveled V-joint with single or double tongue and groove.
   4. Moisture Content: 19 percent, maximum.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.05 WOOD TREATMENT

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment:
   1. Manufacturers:
      a. Lonza Group: www.wolmanizedwood.com/#sle.
      b. Osmose Utilities Services, Inc: www.osmose.com/#sle.
      c. Viance, LLC: www.treatedwood.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Preservative Pressure Treatment of Lumber Decking: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   3. Marking: Mark each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support framing is ready to receive decking.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 INSTALLATION - DECK BOARD CLIPS

A. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - BOARD DECKING

A. Install decking perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.

B. Fit butt end deck joints occurring between support members with metal splines to maintain tight, aligned joints.

C. Engage decking tongue and groove edges.

D. Secure with fasteners. Side spike planks together, through pre-drilled holes.

E. Secure with manufacturer's proprietary fastener system.

F. Maintain decking joint space of 1/16 inch maximum.

3.05 TOLERANCES

A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 061753
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 061000 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2018.

D. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Provide shop drawings stamped or sealed by design engineer.
   2. Submit design calculations.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Engineer experienced in design of this Work and licensed in South Dakota.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Truss Plate Connectors:
   1. Alpine, an ITW Company: www.alpineitw.com/#sle.
   2. MiTek Industries, Inc: www.mii.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with ANSI/TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
   1. Species and Grade: As determined by truss designer.
   2. Connectors: Steel plate.
   3. Structural Design: Comply with applicable code for structural loading criteria.
   4. Design Roof Loading: See plans.
   5. Roof Deflection: 1/240, maximum total load; 1/360 maximum live/snow load.

2.03 MATERIALS

A. Lumber:
   1. All lumber shall conform to the published stress ratings for the species and grades as set out in the official grading rules of the NFPA.
   2. Moisture Content: Between 7 and 15 percent.
   3. Lumber fabricated from old growth timber is not permitted.
   4. Grade stamps shall be plainly visible on all lumber used or cut for truss members.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.04 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 061000.

B. Fasteners: Hot-dip galvanized steel, type to suit application.

2.05 FABRICATION

A. All members shall be fabricated to grades and sizes shown on the approved shop drawings and details.

B. All building layout dimensions for trusses shall be verified by the General Contractor.
   1. The truss members shall be accurately cut to length, angle and be true to line to assure tight joints for finished truss.
   2. All truss members and connector plates shall be properly placed in pecial jigs and the members tightly clamped in place, remaining in that position until the connector plates have been pressed into the lumber, simultaneously on both sides of all joints.
   3. Camber shall be built into the trusses, as noted on the certified engineers designs by proper positioning of the truss members in the fabrication jig.

C. Fabrication tolerances shall conform to the T.P.I. criteria for tightness of joints and correct embedment of plates and accessories. General length or height tolerance is +/- 1/4" each end or each side.

D. Unacceptable material in the form of trusses that have cracks, bends, or other defects that would affect their load-carrying capacity will not be permitted in the work. The Architect and or the Engineer have the right to reject trusses that are unacceptable even after erection of the trusses.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that supports and openings are ready to receive trusses.

C. Inspect trusses to ensure that they are complete, undamaged and properly marked for erection; and that approved erection drawings are on the construction site.
   1. Report any damaged or missing trusses to the Architect and the truss manufacturer immediately.

3.02 PREPARATION

A. Protection:
   1. Use all means necessary to protect trusses before, during, and after delivery to the job site, and to protect the installed work and materials of all other trades.
   2. Deliver the trusses to the job site and store vertically, all in a safe area, out of the way of traffic, and shored up off the ground surface.
   3. Identify all trusses with marks that conform to the submittal drawings.
   4. Protect all metal products with adequate waterproof outer wrappings.
   5. Use extreme care in the off-loading of trusses to prevent damage, splitting, and breaking of materials. Lift trusses only with straps that support the entire weight of the truss.

B. Replacements or damage:In case of damage, immediately make all repairs and replacements necessary, with the prior approval of the Truss Manufacturers Certifying Engineer. Submit this approval to the Architect and Engineer in writing. If the Truss Manufacturer will not certify the repairs in writing, replace the truss. These repairs and replacements shall be made at no additional cost to the Owner.

C. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Erect wood trusses strictly in accordance with approved shop drawings. Set and secure wood trusses level, plumb and in correct location.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Engineer.

E. Do not exceed allowable distance of spacing as shown on the plans and details.

F. Do not overload supporting members by setting trusses at one location on the building supports.

G. Do not store materials onto trusses that would exceed their designed load limit.

H. Install permanent bridging and bracing.

I. Install headers and supports to frame openings required.

J. Frame openings between trusses with lumber in accordance with Section 061000.

K. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

B. Inspect the finished truss installation and verity that trusses are erected in accordance with design.

C. Remove any truss found to be damaged during erection or further construction activities with no additional cost to the owner.

END OF SECTION

SECTION 061800
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams, purlins, and columns.

B. Preservative treatment of wood.

C. Design of all connections, wood-to-wood, wood-to-steel and wood-to-concrete, to the requirements of the building code and standards, taking account of the required fire resistance and acoustic performance.

D. Supply and installation of all connectors and steel plates for wood-to-wood connections.

E. Supply and installation of all connectors (screws, dowels, and bolts) for wood-to-steel and wood-to-concrete connections.

F. Coordination with related steel and concrete work.

G. Steel hardware and attachment brackets.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-In-Place Concrete.

B. Section 051200 - Structural Steel Framing.

C. Section 099000 - Painting and Coating: Field finishing.

1.03 REFERENCE STANDARDS

A. AITC 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species; 2010.

B. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber; 2007.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.

H. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2024).

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2026.

J. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2026.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

M. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings .
   1. Submit design calculations signed and sealed by design engineer.

D. Designer's Qualification Statement.

E. Manufacturer's Qualification Statement.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

G. Erector's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of South Dakota.

B. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.

C. Erector Qualifications: Company specializing in erection of products of the type specified with three years documented experience, and approved by manufacturer.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect members to AITC requirements for individually wrapped.

B. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glued-Laminated Structural Units:
   1. DR Johnson Wood Innovations
   2. Kalensnikoff
   3. StructureLam
   4. Bell Structural Solutions
   5. Smartlam
   6. GruenWald
   7. Vaagen Timbers
   8. Western ArchRib, Structural Wood Systems
   9. Leslie Sales
   10. Boise Cascade Company
   11. Sentinel Structures, Inc.
   12. Wester Wood Structures
   13. Substitutions: See Section 016000 - Product Requirements.

2.02 GLUED-LAMINATED UNITS

A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Architectural grade.
   1. Verify dimensions and site conditions prior to fabrication.
   2. Cut and fit members accurately to length to achieve tight joint fit.
   3. Fabricate member with camber built in.
   4. Do not splice or join members in locations other than those indicated without permission.
   5. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

6. Welding: Perform welding in accordance with AWS D1.1/D1.1M.
7. After end trimming, seal with sealer coat in accordance with AITC requirements.

B. Performance Criteria:
1. Comply with applicable code for loads, seismic zoning, and other load criteria.
2. See Structural Drawings for additional requirements; Sheet S001.

2.03 MATERIALS

A. Lumber: Softwood lumber complying with RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
1. See Structural Drawings - General Structural Notes; Sheet S001.

B. Species:
1. Doug-Fir - Laminated Beams: Combination 24FV for simple spans and 24FV8 for multi-span/cantilever beams.
2. Doug-Fir - Laminated columns are specified as Doug-Fir Combination L2.

C. Steel Connections and Brackets: ASTM A36/A36M weldable quality, prime paint except where embedded in concrete.

D. Anchor Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts primed except where cast in concrete, matching washers.

E. Hardware: ASTM A325 (ASTM A325M) Type 1 high strength heavy hex bolts and ASTM A563 (ASTM A563M) nuts, primed, except where cast in concrete, matching washers.

F. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

G. Bearing Plate Anchors: Expansion shield and lag bolt type for anchorage to concrete.

2.04 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

2.05 FABRICATION

A. Fabricate glue laminated structural members in accordance with AITC Architectural grade.

B. Welding: Perform welding in accordance with AWS D1.1/D1.1M.

C. Verify dimensions and site conditions prior to fabrication.

D. Cut and fit members accurately to length to achieve tight joint fit.

E. Fabricate member with camber built in.

F. Do not splice or join members in locations other than those indicated without permission.

G. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

H. After end trimming, seal with sealer coat in accordance with AITC requirements.

I. Field Finishing of Members: Specified in Section 099000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports are ready to receive units.

B. Verify sufficient end bearing area.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

F. Field Finishing: Specified in Section 099000.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Upholstered cushions.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 064100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

C. PS 1 - Structural Plywood; 2022.

D. PS 20 - American Softwood Lumber Standard; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
   2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of finish wood wall paneling, 12 x 12 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 12 inch long.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for resilient stage floor to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect work from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

E. Place wood flooring materials in stage area at least 7 days in advance of start of installation. Open sealed packages of wood flooring to permit natural adjustment of moisture content.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim; prepare for transparent finish.
   2. Wood Wall Paneling (WD-1).
      a. Basis of Design: Solid Wood Tambour by Surfacing Solution.
      b. Profile: T478: Slat width of 1 inch (25 mm) and height of 1/2 inches (13 mm).
      c. Species and Finish: Poplar, stained to match WilsonArt Nautral Recon, 7996 (PL-1).
      d. Installation: Install products in strict accordance with manufacturer's instructions, approved submittals and in proper relationship to adjacent construction.
         1) Clean substrate of dirt and bond breaking substances prior to beginning installation.
         2) Acclimatize panels at the installation site for a minimum of 48 hours prior to installation.
         3) Roll tambour panels in accordance with manufacturer's instructions to properly space slats.
         4) Follow manufacturer's recommendations for adhesives and mounting devices.
         5) Replace damaged or defaced products prior to Substantial Completion.

2.02 LUMBER MATERIALS

A. Softwood Lumber: pine species, plain sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
   1. Grading: In accordance with rules certified by ALSC; www.alsc.org.

B. Hardwood Lumber: Red Oak species, plain sawn, maximum moisture content of 6 percent; with flat grain, of quality suitable for transparent finish.
   1. Grading: In accordance with NHLA G-101 Grading Rules; www.nhla.org.

2.03 SHEET MATERIALS

A. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
   1. Grading: Certified by the American Plywood Association.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, veneer core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of pine species.

C. Primer: Alkyd primer sealer.

D. Wood Filler: Solvent base, tinted to match surface finish color.

E. Upholstered Cushions.
   1. Cushion Core: 3" thick High-Resilience (HR) Polyurethan foam, 2.5 lb/cf density, 35 Indentation Load Deflection (ILD).
   2. Face Fabric
      a. Manufacturer: Designtex,

b. Name: Ethos,
c. Color: Cordovan,
d. Number: 8060-351,
e. Weight: 19 ounces/linear yard.
f. Content: 100% Polyurethane,
g. Backing: Knit, Polyester (postconsumer Recylced),

2.06 SITE FINISHING MATERIALS

A. Basis of Design: Masters Armor by Old Masters.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. Shop prepare and identify components for book match grain matching during site erection.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 FIELD FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Prime paint surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

1.02 REFERENCE STANDARDS

A. BHMA A156.9 - Cabinet Hardware; 2020.

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.06 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Concealed Surfaces: Manufacturer's option.
   3. Door and Drawer Front Edge Profiles: 3 mm edge band.
   4. Adjustable Shelf Loading: 50 lbs. per sq. ft.
   5. Cabinet Style: Flush overlay.
   6. Drawer Side Construction: Multiple-dovetailed.
   7. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:

1. Wilsonart: www.wilsonart.com.
2. Substitutions: See Section 016000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Countertops are specified in Section 123600.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: As selected by Architect from manufacturer's standard range.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

G. Drop-In Stainless Steel Deal Tray, Item # CTDB12 by CR Laurence Co.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome, painted, or painted finish, for nominal 1 inch spacing adjustments.

C. Countertop Supports:
1. Material: Aluminum
2. Finish/Color: Black powdercoat.
3. Manufacturers:
a. Rakks/Rangine Corporation; Concealed EH Coutertop Support Bracket: www.rakks.com

D. Drawer and Door Pulls: _____.
1. Product: Modern Metal Pull, 873 manufactured by Richelieu.
a. Color: Matte Black.
b. Center to Center Length: 128 mm .

E. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

F. Catches: Magnetic.

G. Drawer Slides:
1. Type: Extension types as scheduled.
2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Manufacturers
a. Accuride International, Inc: www.accuride.com.
b. Grass America Inc: www.grassusa.com.
c. Hettich America, LP: www.hettichamerica.com.
d. Knape & Vogt Manufacturing Company: www.knapeandvogt.com.
e. Substitutions: See Section 016000 - Product Requirements.

H. Hinges: European style concealed self-closing type, steel with polished finish.
1. Manufacturers:

a. Grass America Inc: www.grassusa.com.
b. Hardware Resources: www.hardwareresources.com.
c. Hettich America, LP; Sensys: www.hettichamerica.com/#sle.
d. Julius Blum, Inc: www.blum.com.
e. Substitutions: See Section 016000 - Product Requirements.

2.07 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
   1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2026.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 4 by 4 inch in size illustrating material and surface design of panels.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels: Basis of Design: Marlite, Inc: www.marlite.com
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.
   2. Nudo Products, Inc: www.nudo.com/#sle.
   3. Panolam Industries International, Inc: www.panolam.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels FRP-1: Standard, smooth panel.
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.09 inch.
   3. Surface Design: Smooth.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.
   6. Trim: Anodized.

B. Wall Panels FRP-2: Symmetrix, smart seam.
   1. Panel Size: 4 by 10 feet.
   2. Panel Thickness: 0.09 inch.
   3. Surface Design: 8" x 24" tile configuration, vertical.
   4. Color: White with Grey Grout.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.
   6. Trim: Anodized.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.

1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

B. Trim: Aluminum; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, and continuous wall insulation.

B. Batt insulation and vapor retarder in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 012300 - Alternates: Applies to material specified in this section.

B. Section 033000 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.

C. Section 061000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

D. Section 072119 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

E. Section 072126 - Blown Insulation: Blown-in, gravity-held fibrous insulation.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

B. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2022.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation Over Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. R-value; 1 inch of material at 72 degrees F: 5, minimum.

4. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
5. Board Edges: Square.
6. Water Absorption, Maximum: 0.3 percent, by volume.
7. Manufacturers:
    a. Dow Chemical Co: www.dow.com.
    b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com.
    c. Substitutions: See Section 016000 - Product Requirements.

B. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Complies with ASTM C578, and manufactured using carbon black technology.
1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
6. Board Size: 48 inch by 96 inch.
7. Board Thickness: 2-1/2 inch.
8. Board Edges: square, at long edges.
9. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
10. Manufacturers:
    a. DuPont de Nemours, Inc: www.building.dupont.com/#sle.
    b. _____.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Formaldehyde Content: Zero.
4. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com/#sle.
    b. Johns Manville: www.jm.com/#sle.
    c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mils, 0.012 inch thick.
1. Width: 4.9 feet.
2. Manufacturers:
    a. SIGA Cover Inc; SIGA-Majrex: www.sigacover.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.

C. Flashing Tape: Special polyolefin film with high performance adhesive.
1. Application: Window and door opening flashing tape.
2. Width: As required for application.
3. Primer: Tape manufacturer's recommended product.

D. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

E. Continuous Insulation (CI) Support Systems: Composite framing support (CFS) system consisting of insulated fiberglass reinforced plastic (FRP) girts that support CI and provide cladding attachment support integrated with metal wall panels, brick veneer, CMU veneer, or wood exterior wall cladding.
   1. Substrate: Attach CFS system components to exterior sheathing over wood stud framing.
   2. Depth of Girts: 2-1/2 inch.
   3. Length: 6 inches for clips, and 96 inches for girts.
   4. Spacing of Girts: 16 inches on center, vertically.
   5. Manufacturers:
      a. Advanced Architectural Products, LLC; SMARTci Plus 3-in-1 System: www.smartcisystems.com/#sle.
      b. Armatherm; Z Girt Structural Thermal Break: www.armatherm.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

F. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

G. Wire Mesh: Galvanized steel, hexagonal wire mesh.

H. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.
   1. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION USING COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

A. Install CFS system in accordance with manufacturer's installation instructions.

B. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.

C. Install CFS system to fill-in exterior wall spaces without gaps or voids, and do not compress insulation boards.

D. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids with approved expandable foam sealant.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In exterior wall crevices.
   2. At junctions of dissimilar wall and roof materials.

1.02 RELATED REQUIREMENTS

A. Section 012300 - Alternates: Alternates apply to materials specified in this section.

B. Section 072100 - Thermal Insulation.

1.03 REFERENCE STANDARDS

A. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

D. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.06 FIELD CONDITIONS

A. Do not install insulation when ambient temperature is lower than 70 degrees F.

B. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

C. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. BASF Corporation: www.spf.basf.com/#sle.
   2. Carlisle Spray Foam Insulation: www.carlislesfi.com/#sle.
   3. Bayer MaterialScience; _____: www.spf.bayermaterialscience.com.
   4. Henry Company: www.henry.com/#sle.
   5. Icynene Inc; _____: www.icynene.com/#sle.
   6. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
   7. Holcim; Gaco One Pass Closed Cell.

8. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Aged Thermal Resistance: R-value of 5 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
   2. Water Vapor Permeance: Vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   4. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
   5. Closed Cell Content: At least 90 percent.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to a minimum cured thickness of 3 inch.

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 072200
ROOF AND DECK INSULATION

GENERAL

1.01 SECTION INCLUDES

A. Flat Polyiso Roof Insulation
   1. Faced with oriented strand board or waferboard on one major surface of the core foam and GRF or CGF facer on the other major surface of the core foam.
      a. ACFoam® Nail Base
      b. ACFoam® CrossVent®

B. Tapered Polyiso Roof Insulation
   1. Faced with non-asphaltic, fiber-reinforced cellulosic organic felt facers on both major surfaces of the core foam (GRF).
      a. SureSlope™ TES Tapered Edge Strip

C. Accessories
   1. Atlas Nailable Insulation Fasteners
      a. RELATED SECTIONS

D. 07 26 00 Vapor Retarders

E. 07 27 00 Air Barriers

F. 07 31 00 Shingles and Shakes

G. 07 41 13 Metal Roof Panels
      a. REFERENCES

H. ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.

I. ASTM D312: Standard Specification for Asphalt Used in Roofing.

J. ASTM E108: Standard Test Methods for Fire Tests or Roof Coverings.

K. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials.

L. FM 4450: Approval Standard – Class I Insulated Steel Roof Decks

M. FM 4470: Approval Standard – Class I Roof Covers.

N. FM 4473: Specification Test Standard for Impact Resistance of Rigid Roofing Materials.

O. LTTR: Long Term Thermal Resistance predicated by CAN/ULC-S770-09.

P. UL 263: Fire Tests of Building Construction and Materials.

Q. UL 790: Standard Test Methods for Fire Tests of Roof Coverings.

R. UL 1256: Fire Test Methods for Fire Tests of Roof Coverings.

S. ASTM E2114: Standard Terminology for Sustainability Relative to the Performance of Buildings.

T. ASTM E2129: Standard Practice for Data Collection for Sustainability Assessment of Building Products.
      a. DEFINITIONS

U. LTTR (Long Term Thermal Resistance): Defined as using techniques from ASTM C1303 or CAN/ULC-S770-09, the predicated R-Value that has been shown to be equivalent to the average performance of a permeably faced foam insulation product over 15 years. LTTR applies to ALL foam insulation products with blowing agents other than air, such as Polyiso, extruded polystyrene and polyurethane. The new method is based on consensus standards in the US and Canada.
      a. SUBMITTALS

V. Submit under provisions of Section 01 30 00 and 01 60 00.

W. Product Data:
    1. Manufacturer's Specifications.
    2. Installation instructions for insulation board and fasteners.
    3. Product Data as per ASTM E2129: Standard Practice for Data Collection for Sustainability Assessment of Building Products.

X. Samples:
    1. Submit minimum 6 inch by 6 inch (152 millimeters by 152 millimeters) of each board type required.
    2. Submit samples of each fastener type required.

Y. Shop Drawings:
    1. Roof plan showing layout of boards and fastening patterns.

Z. Certificates:
    1. System Manufacturer's or Insulation Manufacturer's Certification that the insulation meets Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.

AA. Thermal Warranty:
    1. Submit sample warranty indicating conditions and limitations.
        a. QUALITY ASSURANCE

BB. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum twenty five years documented experience.

CC. Installer Qualifications: Company specializing in the installation of products specified in this section with minimum 5 years documented experience in installing products of the same type and scope as specified.

DD. 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 is approved by Architect.
    3. Refinish mock-up area as required to produce acceptable work.

EE. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions and insulation manufacturer's installation instructions.
        a. DELIVERY, STORAGE AND HANDLING

FF. Comply with general requirements specified in sections 01 65 00 and 01 66 00.

GG. Deliver product in packages labeled with material name, thermal value and product code.

HH. When stored outdoors or on the jobsite, the insulation should be stacked on pallets at least three inches above ground level and completely covered with a waterproof covering such as a tarpaulin. The temporary factory-applied packaging should be slit or removed to prevent accumulation of condensation. Insulation which has become wet or damaged should be removed and replaced with solid, dry insulation.
        a. SEQUENCING

II. Ensure that information required for installation of products in this section is furnished to affected trades in time to prevent interruption of construction progress.

JJ. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

KK. Coordinate installation with roof membrane manufacturer's installation instructions.
        a. PROJECT CONDITIONS

LL. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Atlas Roofing Corporation
   1. Address: 2000 Riveredge Parkway Suite 800 Atlanta, GA 30328
   2. Phone: 800-388-6134
   3. Fax: 770-952-3170
   4. Web: www.atlasroofing.com

B. Requests for substitutions will be considered in accordance with provisions of
   1. Section 01 60 00.

2.02 MATERIALS

A. ACFoam® Nail Base Nailable Roof Insulation: Thermally efficient non-structural composite insulation. Consisting of closed-cell ACFoam®-II or ACFoam®-III polyisocyanurate (polyiso) roof insulation board bonded to Oriented Strand Board (OSB) or CDX Plywood on the top face.
   1. Compliance:
      a. ASTM C1289, Type V.
      b. UL Standard 1256 Classification: Construction No. 120, 123 and 458.
      c. UL Standard 790 (ASTM E108): For use with Class A, B or C Shingles, Metal or Tile Roof Coverings.
      d. UL Standard 263 (ASTM E119): Fire Resistance Classification.
      e. UL Standard 1897: Uplift Resistance
      f. FM Standard 4450 and 4470 Approved (1-90, 1-105): Approved for Class 1 Insulated Roof Deck Construction. Refer to FM Approvals® RoofNav for Specific Systems Details.
      g. IBC Chapter 26 and National Building Code: Sections on Foam Insulation.
      h. California State Insulation Quality Standards and Title 25 Foam Flammability Criteria (T 1231).
      i. Miami-Dade County Product Control Approved: NOA No. 17-1211.05.
      j. State of Florida Product Approval: FL17989.
      k. APA and TECO Rated OSB Nailing Surface.
      l. United States Voluntary Product Standard: PS 2 Compliant.
      m. Dimensional Stability (ASTM D2126): less than 2 percent.
      n. Compressive Strength (ASTM D1621): 20 pounds per square inch (140 kPa) or 25 pounds per square inch (172 kPa).
      o. Water Absorption (ASTM C209): less than 1.5 percent.
      p. Water Absorption (ASTM D2842): less than 3.5 percent.
      q. Water Vapor Transmission (ASTM E96): less than 1.0 perm (57.5ng/(Pa•s•m2)).
      r. Product Density (ASTM D1622): nominal 2.0 pounds per cubic foot (32.04 kg/m3).
      s. Flame Spread (ASTM E84 10 minutes): 40-60.
      t. Smoke Development (ASTM E84 10 minutes): 50-170.
      u. Tensile Strength (ASTM D1623): greater than 730 pounds per square foot (35 kPa).
      v. Service Temperature: -100°F to +250°F.
      w. Panel Area:
         1) 4 feet x 8 feet (1220 millimeters x 2440 millimeters)
      x. Composite Panel Thickness: Composite calculations include polyiso layer and 7/16 inch OSB (R-0.55).
         1) 3.5 inch (88.9 millimeters): LTTR - 18.0
      y. Wood Layer Compatibility:
         1) OSB
            (a) 7/16 inch (11.1 millimeters): R - 0.55

B. ACFoam® CrossVent® Nailable Cross Ventilated Roof Insulation: Thermally efficient cross ventilated non-structural composite insulation. Consisting of closed-cell ACFoam®-II or

ACFoam®-III polyisocyanurate (polyiso) roof insulation board and Oriented Strand Board (OSB) or CDX Plywood separated with and bonded to 5 individual Expanded Polystyrene vent spacer strips.

1. Compliance:
    a. ASTM C1289, Type V.
    b. UL Standard 1256 Classification: Construction No. 120, 123 and 458.
    c. UL Standard 790 (ASTM E108): For use with Class A, B or C Shingles, Metal or Tile Roof Coverings.
    d. UL Standard 263 (ASTM E119): Fire Resistance Classification.
    e. FM Standard 4450 and 4470 Approved (1-90, 1-105): Approved for Class 1 Insulated Roof Deck Construction. Refer to FM Approvals® RoofNav for Specific Systems Details.
    f. IBC Chapter 26 and National Building Code: Sections on Foam Insulation.
    g. California State Insulation Quality Standards and Title 25 Foam Flammability Criteria (T 1231).
    h. Miami-Dade County Product Control Approved: NOA No. 17-1211.05.
    i. State of Florida Product Approval: FL17989.
    j. APA and TECO Rated OSB Nailing Surface.
    k. Federal Housing Administration (FHA) Minimum Property and Asphalt Roofing Manufacturers Association (ARMA) Insulated Deck Requirements.
    l. Dimensional Stability (ASTM D2126): less than 2 percent.
    m. Compressive Strength (ASTM D1621): 20 pounds per square inch (140 kPa) or 25 pounds per square inch (172 kPa).
    n. Water Absorption (ASTM C209): less than 1.0 percent.
    o. Water Absorption (ASTM D2842): less than 3.5 percent.
    p. Water Vapor Transmission (ASTM E96): less than 1.0 perm (57.5ng/(Pa•s•m2)).
    q. Product Density (ASTM D1622): nominal 2.0 pounds per cubic foot (32.04 kg/m3).
    r. Flame Spread (ASTM E84 10 minutes): 40-60.
    s. Smoke Development (ASTM E84 10 minutes): 50-170.
    t. Tensile Strength (ASTM D1623): greater than 730 pounds per square foot (35 kPa).
    u. Service Temperature: -100°F to +250°F.
    v. Panel Area:
        1) 4 feet x 8 feet (1220 millimeters x 2440 millimeters)
    w. 1.5 inch Air Space Composite Panel Thickness: Composite calculations include polyiso layer, 1.5 inch EPS vent spacer strip and 7/16 inch OSB.
        1) 4.0 inch (101.6 millimeters): LTTR - 11.4
    x. Vent Strip Compatibility:
        1) 1.5 inch (38.1 millimeters) x 4.0 inch (101.6 millimeters)
            (a) NFA = 14.25 square in per linear foot.
            (b) Compressive: 6000 pounds per square foot compressive resistance
            (c) Moisture, Mold and Rot Resistant
            (d) Continuous fastening support for projects which require an excess of 30 fasteners.
    y. Wood Layer Compatibility:
        1) OSB
            (a) 7/16 inch (11.1 millimeters): R - 0.55
                (1) Available Certifications: FSC, Fire-Treated and Preservative-Treated

C. SureSlope™ TES Tapered Edge Strip: Pre-cut tapered polyisocyanurate (polyiso) roof insulation edge strip fabricated of factory cut Tapered ACFoam®-II or Tapered ACFoam®-III.

1. Compliance:
    a. ACFoam®-II faced product: Tapered or Flat closed-cell polyisocyanurate (polyiso) foam core integrally bonded to non-asphaltic, fiber-reinforced organic felt facers.

1) ASTM C1289, Type II, Class 1, Grade 2 (20 pounds per square inch) or Grade 3 (25 pounds per square inch).
2) CAN/ULC-S704 Type 2, Class 3 or Type 3, Class 3.
3) CCMC No. 12464-L.
4) UL Certified for Canada: Insulated Roof Deck Assemblies Construction No. C38 and 52. Meets CAN/ULC-S126, CAN/ULC-S101 and CAN/ULC-S107.
5) UL Standard 1256 Classification: Construction No. 120, 123 and 292.
6) UL Standard 790 (ASTM E108): Roofing Systems Classification.
7) UL Standard 263 (ASTM E119): Fire Resistance Classification.
8) UL Standard 1897: Uplift Resistance.
9) FM Standard 4450 and 4470 Approved: Refer to FM Approvals® RoofNav for Specific Systems Details.
10) IBC Chapter 26 & National Building Code: Sections on Foam Insulation.
11) California State Insulation Quality Standards and Title 25 Foam Flammability Criteria (T 1231).
12) Miami-Dade County Product Control Approved: NOA No. 17-1211.05.
13) State of Florida Product Approval: FL17989.
14) Dimensional Stability (ASTM D2126): less than 2 percent.
15) Compressive Strength (ASTM D1621): 20 pounds per square inch (140 kPa) or 25 pounds per square inch (172 kPa).
16) Water Absorption (ASTM C209): less than 1.5 percent.
17) Water Absorption (ASTM D2842): less than 3.5 percent.
18) Water Vapor Transmission (ASTM E96): less than 1.5 perm (85.5ng/(Pa•s•m2)).
19) Product Density (ASTM D1622): nominal 2.0 pounds per cubic foot (32.04 kg/m3).
20) Flame Spread (ASTM E84 10 minutes): 40-60.
21) Smoke Development (ASTM E84 10 minutes): 50-170.
22) Tensile Strength (ASTM D1623): greater than 730 pounds per square foot (35 kPa).
23) Service Temperature: -100°F to +250°F.

b. Tapered Panel Thickness
1) TES 1.5
(a) Facer: ACFoam®-II
(b) Panel Area: 12.0 inch x 8.0 feet (305 millimeters x 2440 millimeters)
(c) Slope: 1.5 inch per foot
(d) Minimum Thickness: 0.0 inch (0.0 millimeters)
(e) Maximum thickness: 1.5 inch (38.1 millimeters)

c. ACCESSORIES

D. Atlas Nail Base FastenerHD: Engineered Heavy Duty fastener for ACFoam® Nail Base and ACFoam® CrossVent® Nailable insulation to an approved substrate. Required for proper attachment of all ACFoam® Nailable insulation products.
1. Material: Case hardened and Tempered Carbon Steel
2. Head Style/Drive: Pancake Head with T-30 Internal Drive
3. Head Diameter: 0.625 inch
4. Shank Diameter: 0.212 inch
5. Thread Length: 3.875 inch
6. Coating: Epoxy E-Coat (Black)
7. Overall Length: As reccomended by manufacturer.

EXECUTION

3.01 EXAMINATION

A. Examine roof deck for suitability to receive insulation.

B. Verify that substrate is dry, clean and free of foreign material that will damage insulation or impede installation.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Verify that roof drains, scuppers, roof curbs, nailers, equipment supports, vents and other roof accessories are secured properly and installed in conformance with Contract Documents.

E. Verify that deck is structurally sound to support installers, materials and equipment without damaging or deforming work.
   1. Start of installation indicates installer accepts conditions of existing deck surfaces.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Verify the manufacturer's roof edge details for accuracy to fit the assembly

3.03 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Install specified insulation using approved mechanical fasteners, hot asphalt or adhesives in accordance with manufacturer's written instructions and as required by governing codes and Owner's insurance carrier.

C. Install with end joints staggered to avoid having insulation joints coinciding with joints in deck. In multi-layer installations, stagger joints in top and bottom layers.

D. PROTECTION

E. Remove trash and construction debris from insulation surface prior to application of roofing membrane.

F. Do not leave installed insulation exposed to weather. Cover and waterproof completed roof system immediately after installation.
   1. Temporarily seal exposed insulation edges at the end of each day.
   2. Remove and replace installed insulation that has become wet or damaged with new insulation.

G. Protect installed insulation and roof cover from traffic by use of protective covering materials during and after installation.

END OF SECTION

SECTION 072500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry:

B. Section 072100 - Thermal Insulation:

C. Section 076200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

D. Section 079200 - Joint Sealants: Sealing building expansion joints.

1.03 DEFINITIONS

A. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

E. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).

H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation and storage and handling criteria.

E. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.07 SPECIAL BUILDING ENCLOSURE WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including air/vapor barrier and attachments, framing, and exterior panels) to provide 10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions. www.edacontractors.com/#sle

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   5. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES AC38.
   6. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.
   7. Manufacturers:
      a. Carlisle Coatings and Waterproofing, Inc: www.carlisleccw.com/#sle.
      b. DuPont de Nemours, Inc; Tyvek Commercial Wrap with Tyvek Tape: www.dupont.com/#sle.
      c. Hohmann & Barnard, Inc: www.h-b.com/#sle.
      d. Kimberly-Clark, distributed by Wolf Home Products: www.wolfhomeproducts.com/#sle.
      e. National Shelter Products, Inc: www.drylinewrap.com/#sle.
      f. VaproShield, LLC: www.vaproshield.com/#sle.
      g. Substitutions: See Section 016000 - Product Requirements.

2.02 AIR BARRIER MATERIALS (AIR AND VAPOR BARRIER)

A. Air and Vapor Barrier Sheet, Fluid-Applied:
   1. Property Type: Polymer-modified emulsion.
   2. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   3. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   4. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.
   5. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 365 days of weather exposure.
   6. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
   7. Complies with NFPA 285 wall assembly requirements.
   8. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   9. Manufacturers:
      a. Basis of Design: Tremco Commercial Sealants & Waterproofing; ExoAir 130: www.tremcosealants.com/#sle.
      b. Carlisle Coatings and Waterproofing, Inc: www.carlisleccw.com/#sle.
      c. GCP Applied Technologies: www.gcpat.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Composition: Any material that meets physical requirements of ASTM D1970/D1970M with exceptions indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Use flashing to seal to adjacent construction and to bridge joints.

E. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
   3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 074113
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels.

B. Fastening system.

C. Factory finishing.

D. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Roof sheathing.

B. Section 061500 - Wood Decking: Roof sheathing.

C. Section 072200: Roof and Deck Insulation.

D. Section 074213 - Metal Wall Panels: Preformed wall panels.

E. Section 079200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

F. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.

F. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project.
   1. Not less than 5 years of documented experience.

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 5 year period from date of Substantial Completion.

C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Roof Panels.
   1. Basis of Design: Petersen Aluminum Corporation; Tite-Loc Panel: www.pac-clad.com/#sle.
   2. Berridge Manufacturing Company: www.berridge.com/#sle.
   3. Morin Corporation: www.morincorp.com/#sle.
   4. Holcim Elevate; Una-Clad UC-14.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
      b. Steel Thickness: Minimum 22 gage (.028 inch).
   2. Profile: Standing seam, with minimum 1.75 inch seam height; concealed fastener system lapped seam in standing seam profile.
   3. Length: Full length of roof slope, without lapped horizontal joints.
   4. Width: Maximum panel coverage of 12 inches.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.05 PANEL FINISH

A. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer's standard line.

2.06 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
   1. Downspouts: Open face, rectangular profile.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
   3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.
   1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
   2. Sheet Thickness: 22 mil (0.022 inch) minimum total thickness.
   3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   5. Water Vapor Permeance: 0.067 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
   6. Products:
      a. Henry Company: www.henry.com/#sle.
      b. Polyglass USA, Inc: www.polyglass.us/#sle.
      c. System Components Corporation, Inc: www.systemcomponents.net/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

E. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.
   1. Brackets: Zinc plated steel.
   2. Pipe or Square Tube: Powder coating with color to match roof.
      a. Outside Dimensions, Square: 1 inch, nominal.
   3. Supplemental Plates and Clips: Attached to horizontal component; match finish of pipe, tube, rod, or channel.
   4. Clamps for Standing Seam Roof: Aluminum clamps attached to standing seams of roof panels; for attachment of fence type snow guard.
      a. Seam Profile: Selected by Architect from manufacturer's standard range; match profile of metal roof.
      b. Finish: Powder coating with color to match roof.
   5. Products:

a. Alpine SnowGuards: www.alpinesnowguards.com/#sle.
b. Berger Building Products: www.bergerbp.com/#sle.
c. LMCurbs: www.lmcurbs.com/#sle.
d. Metal Roof Innovations, Ltd. S-5! Attachment Solutions: www.s-5.com/#sle.
e. PMC Industries, Inc: www.aceclamp.com/#sle.
f. Rocky Mountain Snow Guards, Inc: www.rockymountainsnowguards.com/#sle.
g. Substitutions: See Section 016000 - Product Requirements.

2.07 FABRICATION

A. Panels: Fabricate and finish panels and accessory items at factory, using manufacturers standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.

D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

E. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

3.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for walls, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wall panel substrate.

B. Section 072500 - Weather Barriers: Weather barrier under wall panels.

C. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

D. Section 092116 - Gypsum Board Assemblies: Wall panel substrate.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2026.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.

D. Selection Samples: Submit samples of color selection chips in manufacturer's full range, 3 inch x 4 inch.

E. Verification Samples: Submit one samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing the products specified in this section with minimum three years of documented experience.

1.06 MOCK-UP

A. Construct mock-up; include panel system, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation in mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Metal Wall Panels - Concealed Fasteners: Reynobond Aluminum Composite Materials 160FR manufactured by Arconic, Inc..

B. Other Acceptable Manufacturers:
   1. Centria: www.centria.com.
   2. MBCI: www.mbci.com.
   3. Alucobond Plus; 4mm ACM.
   4. Petersen Aluminum Corporation: www.pac-clad.com.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels.
   2. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Maximum Allowable Deflection of Panel: 1/90 of span.
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   6. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.
   7. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in accordance with materials specified in Section 072500.
   8. Exterior Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Exterior Panels:
   1. Profile: Vertical; style as indicated.
   2. Side Seams: Rout-and-return with reveal, .
   3. Material: Composite; 4mm aluminum composite utilizing Reynobond.
   4. Panel Size: See Drawings.
   5. Color: As selected from manufacturer's full range.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

E. Anchors: Galvanized steel.

2.03 FINISHES

A. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

B. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

2.04 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at 24 inches on center, maximum.

3.03 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Use concealed fasteners unless otherwise approved by Architect.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 074623
WOOD SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermally modified exterior wood cladding.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood framing and sheathing.

B. Section 072500 - Weather Barriers: Water-resistive barrier under siding.

1.03 REFERENCE STANDARDS

A. APA PRP-108 - Performance Standards and Qualification Policy for Wood Structural Panels (Form E445); 2021.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

E. FBC TAS 201 - Impact Test Procedures; Testing Application Standard; 1994.

F. FBC TAS 202 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure; Testing Application Standard; 1994.

G. FBC TAS 203 - Criteria for Testing Products Subject To Cyclic Wind Pressure Loading; Testing Application Standard; 1994.

H. SPIB (GR) - Standard Grading Rules; 2021.

I. WCLIB (GR) - WCLB Standard Grading Rules for West Coast & Imported Softwood Lumber No.18; 2024.

J. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's data on materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, and accessories; showing compliance with requirements, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples: Submit two samples 12 by 12 inches in size illustrating color, surface texture and species..

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct mock-up on project site incorporating required materials and workmanship, with minimum size of 8 feet long by 4 feet wide.

C. Locate where directed by Architect.

D. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in ventilated areas with constant minimum temperature of 60 degrees F and maximum relative humidity of 55 percent.

1.08 FIELD CONDITIONS

A. Do not install siding when air temperature or relative humidity are outside manufacturer's limits.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermally Modified Exterior Wood Cladding:
   1. Basis of Design: Arbor Wood Co., www.arborwoodco.com.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Fire Retardant Treated Wood:
   1. Class A Rated, tested to ASTM E2768.
   2. 30-minute burn rated, tested to NFPA 703 ignition resistant/ non-combustible.

2.03 WOOD SIDING MATERIALS

A. Thermally Modified Exterior Wood Cladding
   1. Species: Ash.
   2. Profile: Nickel gap tongue and groove.
   3. Size: Nominal 1 inch x 6 inches.
   4. Installation method: Blind fasteners.
   5. Length structure: 6'-0".
   6. Collection: Natrl
   7. Finish: Pre-oiled with Cutex Extreme.
   8. Surface Texture: Smooth.

2.04 ACCESSORIES

A. Attachment System: Grad Hiden Click-On System.

B. Furring Strips: 3/4 inch thick x 1-1/2 inches wide.

C. Fasteners: Stainless steel, type recommended by cladding manufacturer.

D. Joint Treatment: H-Channel provided by cladding manufacturer.

E. Finish: Cutek Extreme with Cutex Colortone added, color to be selected from manufacturer's full color range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready to receive work.

B. Verify that water-resistive barrier has been correctly and completely installed over substrate; see Section 072500.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

B. Prime paint surfaces in contact with cementitious materials.

3.03 INSTALLATION

A. Install siding and trim in accordance with manufacturer's instructions.

B. Fasten siding securely in place, level and plumb.
   1. Arrange for orderly nailing pattern, blind nail except over trim.
   2. Install siding for natural shed of water.
   3. Position cut ends over bearing surfaces, and sand cut edges smooth and clean.

C. Install corner strips, closures, and trim.

D. Seal exposed wood substrates exposed to weather to prevent water accumulation and moisture intrusion.
   1. Seal penetrations.
   2. Seal exposed cuts of siding and trim; use of field-applied coatings is not permitted.

E. Install metal flashings at internal and external corners, sills, heads of wall openings, and horizontal joints of sheet materials.

F. Touch-up, repair, or replace wood siding materials having damaged factory-applied finish; notify Architect of damaged materials, and confirm acceptable process before completion of this work.

3.04 TOLERANCES

A. Maximum Variation from Plumb and Level: 1/4 inch per 10 feet.

B. Maximum Offset from Joint Alignment: 1/16 inch.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 044313 - Stone Masonry Veneer: Metal flashings embedded in masonry.

B. 047200 - Cast Stone Masonry: Metal flashing embedded in precast concrete.

C. Section 061000 - Rough Carpentry: Wood nailers for sheet metal work.

D. Section 074113 - Metal Roof Panels.

E. Section 074213 - Metal Wall Panels.

F. Section 074623 - Wood Siding.

G. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Selection Samples: Submit one samples, 2x2 inch in size illustrating material and finish of manufacturer's full range for intitial selection.

D. Verification Samples: Submit one samples 12x12 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with CDA A4050, SMACNA (ASMM), CDA A4050, and SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS *COLOR TO MATCH METAL PANEL COLOR- COLOR VARIES WITH LOCATION*

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage (0.0239 inch) thick base metal.

B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage (0.032 inch) thick; plain finish shop pre-coated with modified silicone coating.
   1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel , with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.

E. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

F. Sealant: specified in Section ***079200***.

G. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: Profile as indicated on drawings. Color to match roof assembly.

B. Downspouts: Rectangular profile. Open faced; Color to match roof assembly.

C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

E. Downspout Boots: Steel.

F. Downspout Extenders: Same material and finish as downspouts.

G. Seal metal joints.

2.05 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.06 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Slope gutters 1/4 inch per 10 feet, minimum.

F. Connect downspouts to downspout boots, and seal connection watertight.

3.04 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof hatches, manual and automatic operation, including smoke vents.

B. Ridge vents.

C. Eave vents.

1.02 RELATED REQUIREMENTS

A. Section 074113 - Metal Roof Panels.

B. Section 076200 - Sheet Metal Flashing and Trim.

C. Section 079200 - Joint Sealants

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

B. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2025a.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS

A. Ridge Vents: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
   1. Vent Material: 22-gauge, 0.0299-inch steel.
   2. Perforated Screen: 0.050-inch thick aluminum.
   3. Continuous Z-Brackets: Manufacturer's standard 20 gauge, 0.0359 inch.
   4. Finish: Manufacturer's standard polyvinylidene fluoride (PVDF) coating.
   5. Finish Color: To be selected by Architect from manufacturer's full range.
   6. Products:
      a. Metal-Era "Hi-Perf" ridge vent, sloped roof meets high wall version. www.metalera.com
      b. Substitutions: See Section 016000 - Product Requirements.

B. Eave Vents: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
   1. Vent Material: 22-gauge, 0.0299-inch steel.
   2. Perforated Screen: 24-gauge, 0.0239-inch galvanized steel; with 54 percent open area perforation.
   3. Finish: Manufacturer's standard polyvinylidene fluoride (PVDF) coating.
   4. Finish Color: To be selected by Architect from manufacturer's standard range.
   5. Products:
      a. Metal-Era "Hi-Perf" vented fascia, vented-nailbase version. www.metalera.com
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

B. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

H. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

L. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

N. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow: www.dow.com/#sle.
   3. Hilti, Inc: www.hilti.com/#sle.
   4. Pecora Corporation: www.pecora.com/#sle.
   5. Sika Corporation: www.usa.sika.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   7. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
   8. Substitutions: See Section 016000 - Product Requirements.

B. Self-Leveling Sealants:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow: www.dow.com/#sle.
   3. Pecora Corporation: www.pecora.com/#sle.
   4. Sika Corporation: www.usa.sika.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   6. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.

e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
   c. Other joints indicated below.
3. Do not seal the following types of joints:
   a. Intentional weep holes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
3. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.
4. Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
6. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
7. Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 35 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: To be selected by Architect from manufacturer's full range.
6. Service Temperature Range: Minus 20 to 180 degrees F.
7. Products:
   a. Dow: www.dow.com/#sle.
   b. Pecora Corporation: www.pecora.com/#sle.
   c. Sika Corporation: www.usa.sika.com/#sle.
   d. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Cure Type: Single component, neutral moisture curing.
   5. Service Temperature Range: Minus 65 to 180 degrees F.
   6. Products:
      a. Dow: www.dow.com/#sle.
      b. Pecora Corporation: www.pecora.com/#sle.
      c. Sika Corporation: www.usa.sika.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: To be selected by Architect from manufacturer's full range..
   2. Products:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

D. Hybrid Elastomeric Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 15 to 25, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Service Temperature Range: Minus 75 to 300 degrees F.
   5. Products:
      a. Dow: www.dow.com/#sle.
      b. Tremco Commercial Sealants and Waterproofing: www.tremcosealants.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

E. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Products:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
      d. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

F. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Products:
      a. Sika Corporation: www.usa.sika.com/#sle.

G. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces, Type OP (opaque).
   2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
   3. Products:
      a. Hilti, Inc: www.us.hilti.com/#sle.
      b. Pecora Corporation: www.pecora.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

H. Type ___ - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; non-vapor permeable; intended for fully concealed applications.

2.04 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Products:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Products:
      a. Sika Corporation: www.usa.sika.com/#sle.
      b. W. R. MEADOWS, Inc: www.wrmeadows.com/#sle.
      c. _____.

C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Composition: Multicomponent, 100 percent solids by weight.
   2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
   3. Color: To be selected by Architect from manufacturer's standard colors.
   4. Joint Width, Minimum: 1/8 inch.
   5. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.
   6. Products:
      a. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
5. Products:
    a. Adfast USA Inc: www.adfastcorp.com/#sle.
    b. Nomaco, Inc: www.nomaco.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
    1. Width/depth ratio of 2:1.
    2. Neck dimension no greater than 1/3 of the joint width.
    3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 080671

DOOR HARDWARE SETS

PART 1 - PRODUCTS

1.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 2 -

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - SARGENT
6. HS - HES
7. NO - Norton Rixson
8. OT - Other

Hardware Sets

Set: 1.0

Doors: 100A, 102A

2	Continuous Hinge	BSPFM SLF-HD1 PT	BSP	PE
2	Electric Power Transfer	EL-CEPT	BSP	SU
1	Concealed Vert Rod Exit, Nightlatch	55 56 64 AD8410 P106 x Less Pull	US20D	SA
1	Concealed Vert Rod Exit, Dummy	55 56 AD8410 x Less Pull	US20D	SA
2	Door Pull, offset	RM3311-12 Mtg-Type 12XHD	BSP	RO
2	Concealed Overhead Holder/Stop	1-x36	BSP	NO
1	Automatic Opener, DBL	D6000 Series (Drop Plate as req'd)	BSP	NO
1	Gasketing	by door manufacturer		
2	Sweep	345BSPNB	BSP	PE
1	Threshold	252x3AFG	Alum	PE
2	ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
2	ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
2	Door Contact	By Security Contractor		OT
2	Push Plate Actuator	505		NO

1 Power Supply	By Security Contractor		OT
1 Wiring Diagram	Elevation and Point to Point as Specified		
1 Card Reader	provided by division 28		

Notes:
Door normally closed and locked or left unlocked through the access control system.
Lock side actuator active as programmed by security.
Entrance by valid credential to card reader.
Egress allowed at all times with interior actuator switch always active.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 2.0

Doors: 103B, 103C

1 Continuous Hinge	BSPFM SLF-HD1	BSP	PE
1 Rim Exit Device	64 AD8506 ETMW	US20D	SA
1 Core	6300 or type as req'd	BSP	SA
1 Surface Closer w/ Stop Arm	351 CPS	ED	SA
1 Drop Plate and Brackets/Spacers	as required	BSP	SA
1 Gasketing	by door manufacturer		
1 Sweep	345BSPNB	BSP	PE
1 Threshold	252x3AFG	Alum	PE

Set: 3.0

Doors: 133C

1 Continuous Hinge	BSPFM_HDI PT	BSP	PE
1 Electric Power Transfer	EL-CEPT	BSP	SU
1 Rim Exit Device	[By Div 28] 64 SN200-8876 ETMW	US20D	SA
1 Core	6300 or type as req'd	BSP	SA
1 Surface Closer w/ Stop Arm	351 CPS	ED	SA
1 Kick Plate	K1050 8" high CSK BEV	BSP	RO
1 Head Gasketing	2891BSPNB	BSP	PE
2 Jamb Gasketing	290BSPNB	BSP	PE
1 Sweep	345BSPNB	BSP	PE
1 Threshold	27_x_AFG		PE
1 ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1 Power Supply	By Security Contractor		OT

Notes:
Reader integrated on door.

• Door normally closed and secure
• Free egress at all times
• Presenting valid credential at card reader will allow entry
• Key override provided in case of emergency
• In the event of a power failure, door will remain locked (fail secure)
• Integrated DPS and RX in lock monitor for door ajar and forced entry.

Set: 4.0

Doors: 128, 130

1	Continuous Hinge	BSPFM HDI	BSP	PE
1	Privacy Lock w DB Keyed IND (Always locked)	LB V21 64 8258 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Electric Strike	1600-CLB-LMS	BSP	HS
1	Surface Closer w/ Stop Arm	351 CPS	ED	SA
1	Mop Plate	K1050 6" high CSK BEV	BSP	RO
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Head Gasketing	2891BSPNB	BSP	PE
1	Jamb Gasketing	290BSPNB	BSP	PE
1	Drip Cap	346BSP	BSP	PE
1	Sweep	345BSPNB	BSP	PE
1	Threshold	27_x_AFG		PE
1	ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1	Door Contact	By Security Contractor		OT
1	Power Supply	By Security Contractor		OT

Notes:
• Doors normally closed and secure unless electric strike is unlocked as programmed by security.
• When strike is unlocked, it allows free ingress and egress.
• Deadbolt locks for privacy, allowing use of the restroom.
• Door will be locked (fail secure) in event of power loss.
• Keyed cylinder override for emergency access.
• Door monitored for door ajar and forced entry.

Set: 5.0

Doors: 100B, 102B

6	Hinge	T4A3786 [NRP]	BSP	MK
2	Electric Power Transfer	EL-CEPT	BSP	SU

1	Concealed Vert Rod Exit, Nightlatch	55 56 64 AD8410 P106 x Less Pull	US20D	SA
1	Concealed Vert Rod Exit, Dummy	55 56 AD8410 x Less Pull	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
2	Door Pull, offset	RM3311-12 Mtg-Type 12XHD	BSP	RO
2	Concealed Overhead Holder/Stop	1-x36	BSP	NO
1	Automatic Opener, DBL	D6000 Series (Drop Plate as req'd)	BSP	NO
1	Gasketing	by door manufacturer		
2	Sweep	18061BSPNB	BSP	PE
1	ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1	ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1	Door Contact	By Security Contractor		OT
2	Push Plate Actuator	505		NO
1	Power Supply	By Security Contractor		OT
1	Wiring Diagram	elevation and point to point as specified		
1	Card Reader	provided by division 28		

Notes:

Future access control: Coordinate all with security contractor to allow entry via auto operator and future card reader access.

Access Control Operation:
Door normally closed and locked or left unlocked through the access control system.
Lock side actuator active as programmed by security.
Entrance by valid credential to card reader.
Egress allowed at all times with interior actuator switch always active.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 6.0

Doors: 123

6	Hinge	T4A3786 [NRP]	BSP	MK
2	Continuous Hinge	BSPFM SLF-HD1 PT	BSP	PE
2	Electric Power Transfer	EL-CEPT	BSP	SU
1	Concealed Vert Rod Exit, Nightlatch	55 56 64 AD8410 P106 x Less Pull	US20D	SA
1	Concealed Vert Rod Exit, Dummy	55 56 AD8410 x Less Pull	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
2	Door Pull, offset	RM3311-12 Mtg-Type 12XHD	BSP	RO
2	Surface Closer w/ Stop Arm	351 CPS	ED	SA
1	Gasketing	by door manufacturer		
2	ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK

2 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
2 Door Contact	By Security Contractor		OT
1 Power Supply	By Security Contractor		OT
1 Wiring Diagram	elevation and point to point as specified		
1 Card Reader	provided by division 28		

Notes:
Door normally closed and locked or left unlocked through the access control system.
Entrance by valid credential to card reader.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 7.0

Doors: 114

1 Continuous Hinge	BSPFM SLF-HD1 PT	BSP	PE
1 Push Bar	RM3102 Mtg-Type 12XHD	BSP	RO
1 Door Pull, straight	RM3301-12 Mtg-Type 12XHD	BSP	RO
1 Surface Closer w/ Stop Arm	351 CPS	ED	SA
1 Gasketing	by door manufacturer		

Set: 8.0

Doors: 103A

6 Hinge	T4A3786 [NRP]	BSP	MK
2 Electric Power Transfer	EL-CEPT	BSP	SU
1 Surface Vert Rod Exit	55 56 64 NB-8710 306 Less Pull	US20D	SA
1 Surface Vert Rod Exit	55 56 NB-8710 Less Pull	US20D	SA
1 Core	6300 or type as req'd	BSP	SA
1 Automatic Opener, DBL	D6000 Series (Drop Plate as req'd)	BSP	NO
2 Kick Plate	K1050 8" high CSK BEV	BSP	RO
2 Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1 Astragal	S771C		PE
1 Gasketing	S44BL		PE
1 ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1 Door Contact	By Security Contractor		OT
1 Push Plate Actuator	505		NO
1 Power Supply	By Security Contractor		OT

1 Wiring Diagram	elevation and point to point as specified		
1 Card Reader	provided by division 28		

Notes:
Auto Operator - adjust hold open time and/or "infinite hold open" as required.

Door normally closed and locked or left unlocked through the access control system.
Lock side actuator active as programmed by security.
Entrance by valid credential to card reader.
Egress allowed at all times with interior actuator switch always active.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 9.0

Doors: 105, 110, 110B, 111A, 111B, 120, 133

3 Hinge	TA2714-MCK [NRP]	BSP	MK
1 Electric Power Transfer	EL-CEPT	BSP	SU
1 Access Control Mort Lock, Keyed	[By Div 28] 64 SN200-82271-24V LNMW	US20D	SA
1 Core	6300 or type as req'd	BSP	SA
1 Surface Closer	351 UO	ED	SA
1 Kick Plate	K1050 8" high CSK BEV	BSP	RO
1 Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1 Gasketing	S44BL		PE
1 ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1 Power Supply	By Security Contractor		OT
1 Wiring Diagram	elevation and point to point as specified		

Notes:
Integrated card reader, request to exit and door position switch.

- Doors normally closed and secure.
- Authorized access by valid read at reader
- Egress free for immediate exit at all times
- Door remains locked (fail secure) in event of power loss.
- Keyed cylinder override for emergency access.
- Door monitored for door ajar and forced entry

Set: 9.1

Doors: 106

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Electric Power Transfer	EL-CEPT	BSP	SU
1	Access Control Mort Lock, Keyed	[By Div 28] 64 SN200-82271-24V LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Closer	351 UH	ED	SA
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Gasketing	S44BL		PE
1	ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1	ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1	Power Supply	By Security Contractor		OT
1	Wiring Diagram	elevation and point to point as specified		

Notes:
Integrated card reader, request to exit and door position switch.

• Doors normally closed and secure.
• Authorized access by valid read at reader
• Egress free for immediate exit at all times
• Door remains locked (fail secure) in event of power loss.
• Keyed cylinder override for emergency access.
• Door monitored for door ajar and forced entry

Set: 9.2

Doors: 103D

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Electric Power Transfer	EL-CEPT	BSP	SU
1	Access Control Mort Lock, Keyed	[By Div 28] 64 SN200-82271-24V LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Overhead Holder/Stop	10-x36	BSP	NO
1	Surface Closer	351 UH	ED	SA
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Gasketing	S44BL		PE
1	ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK

1 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1 Power Supply	By Security Contractor		OT
1 Wiring Diagram	elevation and point to point as specified		

Notes:
Integrated card reader, request to exit and door position switch.

• Doors normally closed and secure.
• Authorized access by valid read at reader
• Egress free for immediate exit at all times
• Door remains locked (fail secure) in event of power loss.
• Keyed cylinder override for emergency access.
• Door monitored for door ajar and forced entry

Set: 9.3

Doors: 121

3 Hinge	TA2714-MCK [NRP]	BSP	MK
1 Electric Power Transfer	EL-CEPT	BSP	SU
1 Access Control Mort Lock, Keyed	[By Div 28] 64 SN200-82271-24V LNMW	US20D	SA
1 Core	6300 or type as req'd	BSP	SA
1 Surface Overhead Holder/Stop	10-x36	BSP	NO
1 Surface Closer	351 UO	ED	SA
1 Kick Plate	K1050 8" high CSK BEV	BSP	RO
1 Gasketing	S44BL		PE
1 ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK
1 ElectroLynx Harness - Frame	QC-C3000P (hinge/transfer/magnet/strike to power)		MK
1 Power Supply	By Security Contractor		OT
1 Wiring Diagram	elevation and point to point as specified		

Notes:
Integrated card reader, request to exit and door position switch.

• Doors normally closed and secure.
• Authorized access by valid read at reader
• Egress free for immediate exit at all times
• Door remains locked (fail secure) in event of power loss.
• Keyed cylinder override for emergency access.

• Door monitored for door ajar and forced entry

Set: 10.0

Doors: 137

6	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Dust Proof Strike	570	BSP	RO
2	Flush Bolt	555/557 (as required)	BSP	RO
1	Storeroom/Closet Lock	64 8204 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Closer	351 UO	ED	SA
2	Kick Plate	K1050 8" high CSK BEV	BSP	RO
2	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Astragal	S771C		PE
1	Gasketing	S44BL		PE

Set: 10.1

Doors: 104

6	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Dust Proof Strike	570	BSP	RO
2	Flush Bolt	555/557 (as required)	BSP	RO
1	Storeroom/Closet Lock	64 8204 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
2	Surface Overhead Holder/Stop	10-x36	BSP	NO
2	Silencer	608 / 609 (as req'd)		RO

Set: 10.2

Doors: 136

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Dust Proof Strike	570	BSP	RO
2	Flush Bolt	555/557 (as required)	BSP	RO
1	Classroom Lock	64 8237 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Overhead Holder/Stop	10-x36	BSP	NO
1	Astragal	S771C		PE
1	Gasketing	S44BL		PE

Set: 11.0

Doors: 135

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Storeroom/Closet Lock	64 8204 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Closer	351 UO	ED	SA
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Gasketing	S44BL		PE

Set: 11.1

Doors: 122, 134

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Classroom Lock	64 8237 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Surface Closer	351 UO	ED	SA
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Gasketing	S44BL		PE

Set: 12.0

Doors: 112, 113, 115, 116, 117, 118, 119

3	Hinge	TA2714-MCK [NRP]	BSP	MK
1	Office/Entry Lock	64 8205 LNMW	US20D	SA
1	Core	6300 or type as req'd	BSP	SA
1	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Gasketing	S44BL		PE

Set: 13.0

Doors: 107, 108, 132

3	Hinge	TA2314 [NRP]	BSP	MK
1	Privacy Lock	LB V21 8266 LNMW	US20D	SA
1	Surface Closer	351 UO	ED	SA
1	Mop Plate	K1050 6" high CSK BEV	BSP	RO
1	Kick Plate	K1050 8" high CSK BEV	BSP	RO
1	Wall Stop	RM860 / RM861 / RM850 (as req'd)	BSP	RO
1	Gasketing	S44BL		PE

Set: 14.0

Doors: 133A, 133B

1	Mortise Cylinder	64 42	US15	SA
1	Cylinder	64 980C1	US26D	SA
1	Hardware	all hardware supplied by assembly manufacturer		

Notes:
Coordinate all with door mfr.
Keying as req'd .

END OF SECTION 080671

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Thermally insulated hollow metal doors with frames.

D. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

J. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than _____ years documented experience.

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. De La Fontaine Inc: www.delafontaine.com/#sle.
   4. Republic Doors: www.republicdoor.com.
   5. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

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

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

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inch, nominal.
   3. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   4. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.

C. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. General:
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. Frames for Wood Doors: Comply with frame requirements in accordance with ANSI/SDI A250.8 (SDI-100), Level 1, 18 gage, 0.042 inch, minimum thickness.
   2. Finish: Same as for door.
   3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

D. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
   3. Frame Finish: Factory primed and field finished.
   4. Weatherstripping: Separate, see Section 087100.

E. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
   2. Frame Finish: Factory primed and field finished.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 FINISHES

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

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gage, 0.0478 inch, galvanized steel.
   3. Glazing: 1/4 inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.07 FINISHES

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

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

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

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 087100.

D. Comply with glazing installation requirements of Section 088000.

E. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

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

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2026.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Specimen warranty.

E. Samples: Submit two samples of door veneer, 6 by 6 inch in size illustrating wood grain, stain color, and sheen.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Graham Wood Doors: www.grahamdoors.com.
   2. VT Industries, Inc: www.vtindustries.com/#sle.

2.02 DOORS AND PANELS

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing with factory transparent finishmatching sample provided by Architect.

2.03 DOOR AND PANEL CORES

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

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

2.05 ACCESSORIES

A. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: {\rs\#1}.
   2. Glazing: Single vision units, 1/4 inch glass.
   3. Tint: Clear.

B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Non-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge.

2.06 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain basis of design: Clear CL18, by VT Industries, Inc.
      c. Sheen: Flat.

B. Factory finish doors in accordance with sample to be provided.

2.08 ACCESSORIES

A. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. Glazing: Single vision units, 1/4 inch thick glass.
   3. Tint: Clear.

B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

C. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall access door and frame units.

B. Ceiling access door and frame units.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Wall-Mounted Units:
   1. Panel Material: Steel.
   2. Size: 12 by 12 inches.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Walls in Wet Areas:
   1. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size: 18 by 18 inch, unless otherwise indicated.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Ceilings, Unless Otherwise Indicated:
   1. Material: Steel.
   2. Size in Other Ceilings: 24 by 24 inch, unless otherwise indicated.
   3. Standard duty, hinged door.
   4. Tool-operated spring or cam lock; no handle.

2.02 WALL AND CEILING UNITS

A. Manufacturers:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Units in Walls, Unless Otherwise Indicated: ACUDOR ADWT.
      b. Units in Fire-Rated Walls Rated 2 Hours and Less: ACUDOR FW-5015.
   3. Babcock-Davis: www.babcockdavis.com/#sle.
   4. Cendrex, Inc: www.cendrex.com/#sle.
      a. Units in Fire-Rated Ceilings: Cendrex PFI series, downward opening.
   5. Karp Associates, Inc: www.karpinc.com.
   6. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.
   7. Nystrom, Inc: www.nystrom.com/#sle.
   8. Substitutions: See Section 016000 - Product Requirements.

B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies that units are to be installed in.
   1. Material: Steel.
   2. Style: Frame concealed by door panel.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Frames: 16 gage, 0.0598 inch, minimum thickness.
   5. Single Steel Sheet Door Panels: 1/16 inch, minimum thickness.
   6. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly that access doors are being installed.
   7. Steel Finish: Primed.
   8. Primed and Factory Finish: Polyester powder coat; color as scheduled.
   9. Size: As indicated on the drawings.
   10. Hardware:
      a. Hardware for Fire Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      c. Latch/Lock: Tamperproof tool-operated cam latch.
      d. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 083313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Electric motor operation; wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough openings.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 092116 - Gypsum Board Assemblies: Rough openings.

D. Section 260583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ITS (DIR) - Directory of Listed Products; Current Edition.

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

H. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Two slats, 4 inches long, illustrating shape, color, and finish texture.

E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

F. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

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

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified in this section and indicated on the drawings.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. C.H.I. Overhead Doors; Model 6522 (steel): www.chiohd.com/#sle.
   2. Overhead Door Corporation; Counter Door - Model 650: www.overheaddoor.com/#sle.
   3. Raynor Garage Doors: www.raynor.com/#sle.
   4. Wayne-Dalton, a Division of Overhead Door Corporation; Security Shutter - Model 523: www.wayne-dalton.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Metal Doors, Non-Fire-Rated: Galvanized steel slat curtain.
   1. Mounting: Interior face mounted.
   2. Nominal Slat Size: 2 inches wide.
   3. Slat Profile: Flat, perforated.
   4. Finish, Galvanized Steel: Factory powder coated.
   5. Color: As selected by Architect from manufacturer's custom range.
   6. Guides: Formed track; same material and finish unless otherwise indicated.
   7. Hood Enclosure: Manufacturer's standard; primed steel.
   8. Electric operation.
   9. Locking Devices: Slide bolt on inside.

2.03 COMPONENTS

A. Metal Curtain Construction: Interlocking, single-thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with tube to provide reinforcement and positive contact in closed position; neoprene astragal along bottom edge.
   3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 16 gauge, 0.06 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.
   2. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction (AHJ) as suitable for purpose specified and indicated.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.

2. Motor Enclosure: NEMA MG 00001.
3. Motor Rating: As recommended by manufacturer; continuous duty.
4. Motor Voltage: 110-120 VAC, single phase, 60 Hz.
5. Opening Speed: 6 inches per second.
6. Manual override in case of power failure.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each electrical operator.
1. Controls: 24 VAC circuit.
2. Surface mounted.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 260583.

F. Complete wiring from disconnect to unit components.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 083613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Steel channel opening frame.

B. Section 061000 - Rough Carpentry: Rough wood framing for door opening.

C. Section 079005 - Joint Sealers: Perimeter sealant and backup materials.

D. Section 087100 - Door Hardware: Lock cylinders.

E. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

H. DASMA 102 - American National Standard Specifications for Sectional Doors; 2018.

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

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Samples: Submit two panel finish samples, 12x12 inch in size, illustrating color and finish.

E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

F. Operation Data: Include normal operation, troubleshooting, and adjusting.

G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

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

C. Comply with applicable code for motor and motor control requirements.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor and transmission.

D. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
   1. C.H.I. Overhead Doors: www.chiohd.com.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
   2. Door Nominal Thickness: 2 inches thick.
   3. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
   4. Interior Finish: Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
   5. Glazed Lights: four glazed lights per panel, one rows; set in place with resilient glazing channel.
   6. Electric Operation: Electric control station.

B. Door Panels: Steel construction; outer steel sheet of 20 gage, 0.0359 inch minimum thickness, flat profile; inner steel sheet of 20 gage, 0.0359 inch minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

C. Glazing: Double thermal acrylic; insulated; clear; 1/2 inch thick.

2.03 DOOR COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch minimum thickness; 3 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of stainless steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided stainless steel lifting cables.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

H. Lock Cylinders: Keyed alike.

2.04 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Insulation: Foamed-in-place polyurethane, bonded to facing.

2.05 ELECTRICAL OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by a testing agency acceptable to authorities having jurisdiction or UL.

B. Electrical Characteristics:
   1. Mounting: Center mounted draw bar assembly.
   2. 1/3 hp; manually operable in case of power failure, transit speed of 12 inches per second.
   3. 120 volts, single phase, 60 Hz.

C. Motor: NEMA MG 1, Type 1.

D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

E. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

F. Disconnect Switch: Factory mount disconnect switch in control panel.

G. Electric Operator: trolley style, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

H. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to stop door upon striking object; hollow neoprene covered to provide weatherstrip seal.
   1. Manufacturers:
      a. Miller Edge, Inc: www.MillerEdge.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

I. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
   1. 24 volt circuit.
   2. Surface mounted.
   3. Locate at inside door jamb.

J. Provide interconnection to security system.

K. Radio Control Antenna Detector:

L. Hand Held Transmitter: Digital control, resettable. 2 per operator.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install perimeter trim.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

E. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 019119-Commissioning of Building Enclosure (BECx): Commissioning requirements and procedures.

B. Section 072500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

C. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 084413 - Glazed Aluminum Curtain Walls.

E. Section 087100 - Door Hardware: Hardware items other than specified in this section.

F. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

B. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Samples: Submit two aluminum samples 2 x 4 inches in size.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Designer's Qualification Statement.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors:
   1. Kawneer North America: www.kawneer.com.
   2. Manko Window Systems, Inc: www.mankowindows.com.
   3. Tubelite, Inc: www.tubeliteinc.com.
   4. YKK AP: www.ykkap.com.
   5. Substitutions: See Section 016000 - Product Requirements.

2.03 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Front-set.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   3. ***Finish: Class I natural anodized.***
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   4. Finish Color: Dark bronze.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   11. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements:
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 6.66 psf
   3. Air Leakage Laboratory Test: Maximum of 0.09 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.
   4. Condensation Resistance Factor of Framing: 63, minimum, measured in accordance with AAMA 1503.
   5. Overall U-value Including Glazing: 0.36 Btu/(hr sq ft deg F), maximum.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 088000.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Finish: Same as storefront.

D. Swing Doors: Glazed thermally broken aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 6 inches wide.
   3. Vertical Stiles: 6 inches wide.
   4. Bottom Rail: 12 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

E. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

G. Sealant for Setting Thresholds: Non-curing butyl type.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 088000.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: As specified in Section 087100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Set thresholds in bed of sealant and secure.

K. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass and metal infill panels.

B. Firestopping between curtain wall and edge of floor slab.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Weld plates embedded in concrete for attachment of anchors.

B. Section 051200 - Structural Steel Framing: Steel attachment members.

C. Section 079005 - Joint Sealers: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

E. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

L. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2026.

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

N. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

O. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples in manufacturer's standard sample sizes illustrating finished aluminum surface of curtain wall and insulated infill panels, .

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Designer's Qualification Statement.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glazed Aluminum Curtain Walls:
   1. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/#sle.
   2. Kawneer North America: www.kawneer.com/#sle.
   3. Oldcastle Building Envelope: www.oldcastlebe.com/#sle.
   4. Tubelite, Inc: www.tubeliteinc.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Outside glazed, with pressure plate and mullion cover, where indicated on drawings.
   2. Fabrication Method: Either shop/factory or field fabricated system.
   3. Glazing Method: Either shop/factory or field glazed system.
   4. Vertical Mullion Dimensions: Reference drawings.
   5. Finish: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   6. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the applicable code.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.
      b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
      c. Movement of curtain wall relative to perimeter framing.
      d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
   1. Test Pressure Differential: 10 psf.

D. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Framing members for interior applications need not be thermally broken.
2. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 088000.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
1. Basis of Design: Mapes Architectural Panels, Mapes-R Infill Panel. www.mapespanels.com.
2. Core: 2# Density Polyisocyanurate insulation core with R-value of 6.
3. Back Sheet: 1/8 inch thick tempered hardboard.
4. Interior and Exterior Finish: Class I natural anodized.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; shop primed.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

F. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 088000.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Color: As indicated on drawings.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill and head flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. Provide field testing of installed curtain wall system by AAMA accredited independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
   4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
      a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft.

C. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

SECTION 085653
SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security transaction windows with pass-through device.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies:

B. Section 102641 - Ballistics Resistant Panels

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

B. ASTM A627 - Standard Test Methods for Tool-Resisting Steel Bars, Flats, and Shapes for Detention and Correctional Facilities; 2003 (Reapproved 2019).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2026.

F. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2026.

G. ASTM F1915 - Standard Test Methods for Glazing for Detention Facilities; 2005 (Reapproved 2025).

H. HPW-TP-0500.03 - Test Procedure-Transparent Materials for Use in Forced Entry or Containment Barriers; 2003.

I. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials; 1985.

J. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied; 2023.

K. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
   1. For new work show required opening dimensions and allowance for field deviation.
   2. For field glazed windows, include detailed instructions for glazing installation.

D. Samples of Color Anodized Finishes: Frame member sections showing range of color to be expected in finished work.

E. Samples:
   1. Samples of each type of hardware and operator.

F. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

G. Manufacturer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with at least 5 years experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.

B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:
   1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
   2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 ASSEMBLIES

A. Security and Detention Windows:
   1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 016000.
   2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
   3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
   4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
   5. Design interface between frame and adjacent construction so that gap between them has at least the equivalent performance as specified for window; coordinate with anchorage requirements; custom testing is not required.
   6. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
   7. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
   8. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.02 SECURITY TRANSACTION WINDOWS WITH PASS-THROUGH DEVICE

A. Security Transaction Windows:
   1. Location: Built within exterior and interior wall, as indicated on drawings.
   2. Type of Use: Walk-up.
   3. Ballistic Resistance: Tested to meet UL 752, Level 1.
   4. Glazing Material: 3/4" GCP 750 Glass Clad.
   5. Window Type: Fixed.
      a. Mounting: Flush with the wall surface.
      b. Window Size: As indicated on drawings.
      c. Size of Counter Space: As indicated on drawings.
      d. Material: Aluminum.

1) Finish Color: Dark Bronze.

6. Glazing: Single (monolithic), clear, and ballistic resistant.
7. Communication: Standard talk-through portal.
8. Products:
   a. Total Security Solutions, Speak Hole and Backer Transaction Line System, Part #: TLS_SPEAK_HOLE
   b. Substitutions: See Section 016000 - Product Requirements.

2.03 ASSEMBLY COMPONENTS

A. Aluminum Framing: ASTM B221 (ASTM B221M) extrusions of alloy and temper selected by manufacturer for strength, corrosion resistance, and finish required; not less that 1/8 inch thick at any location of frame and sash members.

B. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
   1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.

C. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.

D. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.

E. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.
   1. Style: Plain curved recess with exposed flanges for flush mounting in counter or sill.
   2. Style: Ricochet-resistant, with recessed bullet trap on secure side, with sliding cover.
   3. Clear Opening Height: 1-1/2 inches.
   4. Tray Dimensions: 12 by 8 inches, wide by deep.

F. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch minimum thickness per coat.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.04 FINISHES

A. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and drawing details.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Separate metal members from concrete and masonry using bituminous paint.

E. Set sill members and sill flashing in continuous bead of sealant.

3.03 CLEANING

A. Clean exposed surfaces promptly after installation without damaging finishes.

B. Remove and replace defective work.

END OF SECTION

SECTION 087100
DOOR HARDWARE

GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. 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. Automatic operators.
   4. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 01 Section "General Conditions”.
   2. Division 06 Section “Rough Carpentry”.
   3. Division 06 Section “Finish Carpentry”.
   4. Division 08 Section “Operations and Maintenance”.
   5. Division 08 Section “Hollow Metal Doors and Frames”.
   6. Division 08 Section “Interior Aluminum Doors and Frames”.
   7. Division 08 Section “Flush Wood Doors”.
   8. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   9. Division 08 Section “Automatic Door Operators”.
   10. Division 26 Section "Electrical”
   11. Division 28 Section “Integrated Access Control Hardware Devices”.

D. Codes and References: Comply with the version 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. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   8. State Building Codes, Local Amendments.

E. 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.

1.03 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. 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.

1.04 CLOSEOUT SUBMITTALS

A. 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.

1.05 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 indicating compliance with the referenced testing 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 according to manufacturer's instructions and recommendations and according to approved schedule.

1.06 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".

1.07 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 Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. 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.

1.08 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.

PRODUCTS

2.01 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

B. Substitutions: 016000 - Product Requirements.

2.02 BUTT HINGES

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 all out-swinging lockable doors.
5. Manufacturers:
   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.03 CONTINUOUS HINGES

A. 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. Pemko (PE).

2.04 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Manufacturers:
      a. Pemko (PE) - EL-CEPT Series.
      b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
   1. Provide one each of the following tools as part of the base bid contract:
      a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
      b. McKinney (MK) - Connector Hand Tool: QC-R003.
   2. Manufacturers:
      a. McKinney (MK) - QC-C Series.

2.05 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. Rockwood (RO).

B. 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 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. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
    a. Rockwood (RO).

2.06 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.
1. Manufacturers:
    a. Sargent Manufacturing (SA).

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. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

E. 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. Existing System: Field verify and key cylinders to match Owner's existing system.

F. 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).

G. Construction Keying: Provide construction master keyed cylinders.

H. 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.

2.07 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).

2.08 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.

2.09 INTEGRATED WIRED OUTPUT LOCKING DEVICES - MULTI-CLASS READER

A. Integrated Wired Output Multi-Class Mortise Locks: Wiegand or Open Supervised Device Protocol (OSDP) output ANSI A156.13, Grade 1, mortise lockset with integrated card reader with or without keypad option, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
2. Integrated reader supports the following credentials:
a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
e. NFC-enabled mobile phones
f. PIN code only or PIN + credential with keypad option.
3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 500mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
5. Support end-of-line resistors contained within the lock case.

6. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
7. Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
8. Manufacturers:
    a. Corbin Russwin (RU) - ML2000 SN Series.
    b. Sargent Manufacturing (SA) - SN200/SN210 8200 Series.

2.10 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.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
    1. Manufacturers:
        a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 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. 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.
7. 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.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. 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 exit devices. Listed manufacturers shall meet all functions and features as specified herein.
    1. Electromechanical exit devices shall have the following functions and features:
        a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
        b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
        c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
        d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
        e. Five-year limited warranty for electromechanical features.
    2. Manufacturers:
        a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
        b. Sargent Manufacturing (SA) - 80 Series.

2.13 INTEGRATED WIRED OUTPUT EXIT DEVICES - MULTI-CLASS READER

A. Integrated Wired Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader with or without keypad option, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
    1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
    2. Integrated reader supports the following credentials:
        a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
        b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
        c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
        d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
        e. NFC-enabled mobile phones
        f. PIN code only or PIN + credential with keypad option

3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Competitor Alternates Allowed Option: Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
6. Manufacturers:
    a. Corbin Russwin (RU) - ED5000 SN Series.
    b. Sargent Manufacturing (SA) - SN200/SN210 80 Series.

2.14 SURFACE 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.

2.15 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48” wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48” wide. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide operators with features as follows:
    a. Non-handed with push and pull side mounting.
    b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.

c. Activation by push button, hands-free or radio frequency devices.
d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
e. Two-year limited warranty.
f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
1) Simple setup with no app required.
2) View status and make adjustments without removing the cover.
3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:
a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
c. Infinite Hold Open: Door will hold open at set position until power is turned off.
d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
e. Open Delay: Delays operator opening for locking hardware.
f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:
a. Norton Rixson (NO) - 6000 Series.

2.16 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1" less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide protective trim with functions and features as follows:
a. Meets ADA requirements for smooth bottom door surfaces.
b. UL Classified options for use on fire-rated doors up to 3 hours.
c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
f. Fasteners included; adhesive-backed options available for select models.
g. Ten-year limited warranty.

2. Manufacturers:
a. Rockwood (RO).

2.17 DOOR STOPS AND HOLDERS

A. 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. Rockwood (RO).

B. 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 (NO).
      b. Rockwood (RO).
      c. Sargent Manufacturing (SA).

2.18 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 NFPA 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. Pemko (PE).

2.19 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.

2.20 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.

EXECUTION

3.01 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.

3.02 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.03 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. Paint prime coated mullions to match frames.

C. 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.

D. 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.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. 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.

3.04 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.

3.05 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.

3.06 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.

3.07 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.08 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 087100

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic films.

D. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 081213 - Hollow Metal Frames: Glazed borrowed lites.

D. Section 081416 - Flush Wood Doors: Glazed lites in doors.

E. Section 084313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

F. Section 084413 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

G. Section 085653 - Security Windows.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. ITS (DIR) - Directory of Listed Products; Current Edition.

I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

J. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

K. UL (DIR) - Online Certifications Directory; Current Edition.

L. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

M. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

O. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit one samples 12 by 12 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Industries Corp.: www.sunguardglass.com/#sle.
   3. Pilkington North America Inc.: www.pilkington.com/na.
   4. PPG Industries, Inc.: www.ppgideascapes.com/#sle.
   5. Oldcastle, Inc.: www.obe.com.
   6. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Select type and thickness of exterior glazing assemblies to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. Maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide glass products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
4. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality-Q3, color and performance characteristics as indicated.

2.04 INSULATING GLASS UNITS

A. Insulating Glass Units Manufacturers:
   1. Any of the manufacturers specified for float glass.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Warm-Edge Spacers: _____.
      a. Spacer Width: As required for specified insulating glass unit.
      b. Manufacturers:
         1) Basis of Design: Viracon VTS spacer.
         2) Substitutions: Refer to Section 016000 - Product Requirements.
   3. Spacer Color: Black.
   4. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   5. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

C. Type IGU-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   5. Total Thickness: 1 inch.
   6. Overall U-value within system: [.95] Btu/(hr sq ft deg F), maximum.
   7. Visible Light Transmittance (VLT): 65 percent, nominal.
   8. Solar Heat Gain Coefficient (SHGC): .27 percent, nominal.
   9. Visible Light Reflectance, Outside: 11 percent, nominal.
   10. Glazing Method: Dry glazing method, gasket glazing.

D. Type IGU-1A & IGU-2A - Insulating Glass Units: Safety glazing.
   1. Applications:
      a. Glazed lites in exterior doors.
      b. Glazed sidelights and panels next to doors.
      c. Other locations required by applicable federal, state, and local codes and regulations.
   2. Space between lites filled with argon.
   3. Glass Type: Same as Type IGU-1 except use fully tempered float glass for both outboard and inboard lites.
   4. Total Thickness: 1 inch.

2.05 GLAZING UNITS

A. Type M-1 - Transparent One-Way Mirror: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
   1. Applications: Locations as indicated on drawings.
   2. Thickness: 1/4 inch.

3. Glass Tint: Grey.
4. Glass Type: Annealed.
5. Lighting Ratio: Maintain at least 8:1 lighting level ratio between coated side (bright-observed side) and uncoated side (dim-observer side).
6. Glazing Method: Gasket glazing.
7. Manufacturers:

2.06 PLASTIC FILMS

A. Type WF-1 - Decorative Plastic Film: Polyester type.
   1. Application: Custom City of Harrisburg Logo.
   2. Size: 12" diameter.
   3. Locations
      a. Frame type 'R': Apply 12" diameter logo on doors and sidelites.
      b. Frame type 'S': Apply 12" diameter logo on doors. Apply full film coverage with 12" diameter logo cutout at sidelites.
   4. Series Type: Crystal Glass Finishes.
   5. Color: Frost.
   6. Thickness Without Liner: 0.002 inch.
   7. Manufacturers: Basis of Design: 3M
      a. Substitutions: Refer to Section 016000 - Product Requirements.

2.07 GLAZING COMPOUNDS

A. Manufacturers:
   1. Bostik Inc: www.bostik-us.com.
   2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
   3. Pecora Corporation: www.pecora.com.
   4. BASF Corporation: www.basf.com/us/en.html.
   5. Substitutions: Refer to Section 016000 - Product Requirements.

2.08 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

D. Glazing Clips: Manufacturer's standard type.

E. Drips at head.

F. Flashing at sill.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing sealants in accordance with ASTM C1193, GANA Sealant Manual, and manufacturer's instructions.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 088300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Tempered safety glass.

1.02 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2025.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

C. GANA (GM) - GANA Glazing Manual; 2022.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Samples: Submit two samples, 4 X 4 inch in size, illustrating mirrors design, edging, and coloration.

D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com/#sle.
   2. Lenoir Mirror Co: www.lenoirmirror.com/#sle.
   3. Trulite Glass and Aluminum Solutions: www.trulite.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch.
   2. Edges: Arrised.
   3. Size: As indicated on drawings.

2.03 ACCESSORIES

A. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
   1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.
   2. Manufacturers:
      a. Liquid Nails, a brand of PPG Architectural Coatings; LN-730 Mirror Adhesive: www.liquidnails.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

A. Remove labels after work is complete.

B. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal channel ceiling framing.

C. Acoustic insulation.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Building framing and sheathing.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

D. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

E. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

G. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

I. ASTM E413 - Classification for Rating Sound Insulation; 2022.

J. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire Rated Partitions, Ceilings, and Soffits : See Drawings.
   2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. National Gypsum Company: www.nationalgypsum.com/#sle.
   5. USG Corporation: www.usg.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
   5. Paper-Faced Products:
      a. American Gypsum Company; LightRoc Gypsum Wallboard.
      b. CertainTeed Corporation; Type C Drywall.
      c. Georgia-Pacific Gypsum; ToughRock.
      d. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board.
   6. Glass Mat Faced Products:
      a. Continental Building Products; Weather Defense Platinum Interior.
      b. Georgia-Pacific Gypsum; DensArmor Plus.
      c. National Gypsum Company; Gold Bond eXP Interior Extreme Gypsum Panel.
      d. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.
      e. Substitutions: See Section 016000 - Product Requirements.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
   2. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
      a. Regular Type: Thickness 1/2 inch.
      b. Products:
         1) Georgia-Pacific Gypsum; DensShield Tile Backer.
         2) National Gypsum Company; Gold Bond eXP Tile Backer.
         3) Substitutions: See Section 016000 - Product Requirements.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 5/8 inch.
   3. Edges: Tapered.
   4. Products:
      a. American Gypsum; Interior Ceiling Board.
      b. CertainTeed Corporation; ProRoc Interior Ceiling.
      c. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board.

d. Lafarge North America Inc; Sagcheck.
e. National Gypsum Company; High Strength Brand Ceiling Board.
f. Pacific Coast Building Products, Inc; PABCO Ceiling Board.
g. USG Corporation; Sheetrock Brand Sag-Resistant Interior Gypsum Ceiling Board.
h. Substitutions: See Section 016000 - Product Requirements.

E. Ceiling Board For Wet Areas: Mold and moisture resistant gypsum ceiling board with fiberglass mats as defined in ; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings in wet areas, unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.
4. Products:
a. Basis of Design: Georgia-Pacific Gypsum; DensArmor Plus.
b. Substitutions: See Section 016000 - Product Requirements.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 6 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:
a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Expansion Joints:
a. Type: V-shaped PVC with tear away fins.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Ready-mixed vinyl-based joint compound.
3. Chemical hardening type compound.

E. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
1. Products:
a. USG; Tuff-Hide Primer-Surfacer.
b. Substitutions: See Section 016000 - Product Requirements.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls to receive paint finish or wall coverings and other areas specifically indicated.
   2. Level 4: Ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
   3. Taping, filling, and sanding are not required at base layer of double-layer applications.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 092953
EXTRUDED ALUMINUM PARTITION GAP CLOSURE

PART 1 – GENERAL

1.01 1.01 SECTION INCLUDES:

A. This section includes drywall accessories or noise control components featuring Mullion Mate® Pro Extruded Aluminum Partition Gap Closure, as shown on the Architectural Drawings.

B. Related sections include the following:
   1. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
   2. Section 084413 “Curtain Wall and Glazed Assemblies” for Curtain Wall Construction
   3. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
   4. Section 092613 "Gypsum Veneer Plastering" for gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
   5. Section 092900 "Gypsum Board" for interior gypsum board, accessories, trim, and finishes.

1.02 RELATED DOCUMENTS/SECTIONS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

B. Division 1 Specification sections as it applies to the work of this Section.

C. Finish Schedule or Finish Legend as it applies to work of this Section.

1.03 REFERENCES:

A. GENERAL
   1. Comply with applicable requirements of the following, except where more stringent requirements are indicated by building codes.

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 2604 – Specification for Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

C. ASTM (American Society for Testing and Materials)
   1. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
   2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E1399/E1399M Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
   4. ASTM E90-2016 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. National Association of Architectural Metal Manufacturers (NAAMM)
   1. Metal Finishes Manual for Architectural and Metal Products

1.04 DESIGN/PERFORMANCE REQUIREMENTS:

A. All components of the Mullion Mate® Pro Extruded Aluminum Partition Gap Closure shall be provided by one (1) Manufacturer to ensure single source responsibility and quality control.

B. Partition Gap Closure shall meet specified performance requirements listed in ASTM E1399/E1399M-97 for the joint width minimum and maximum dimension verification as well as the cyclic movement performance for Class IV – Combined movement which encompasses Seismic, Thermal and Wind Sway, movement at a cycling rate greater than or equal to 10 cycles per minute.

C. Sound Transmission Class (STC) for Mullion Mate® Pro Extruded Aluminum Partition Gap Closure per ASTM E90-2016. See Table A for specific STC ratings.

TABLE A

A. Fire Performance: Products shall be classified as Class A interior finish per NFPA 101 and IBC Section 803.1.1 with a maximum flame spread index of 0 and a maximum smoke-developed index of 15, when tested in accordance with ASTM E84.

1.05 SUBMITTALS:

A. Submissions must be made within ten (10) working days of the General Contract Award to avoid project delay.

B. Product Data: Submit Manufacturer's:
   1. Product Specifications
   2. Detail Drawings
   3. Installation Instructions

C. Samples:
   1. Submit samples consisting of 12" long Mullion Mate® Pro Extruded Aluminum Partition Gap Closure and finish Q-Panel as specified, as well as accessories.

1.06 QUALITY ASSURANCE:

A. Source Limitations:
   1. All components of the Mullion Mate® Pro Extruded Aluminum Partition Gap Closures shall be provided by a single Manufacturer to ensure responsibility and quality control.

B. Manufacturer Qualifications:
   1. A manufacturer must have manufacturing and delivery capacity required for the project and shall have successfully completed at least ten (10) projects within the past five (5) years, utilizing systems, materials, and techniques as herein specified.
   2. A manufacturer must own and operate its own manufacturing facilities for all metal components. "Stick Built" or "Kit of Parts Systems" consisting of components from a variety of Manufacturers/Fabricators will not be considered or accepted.
   3. Manufacturer must own and operate its own painting and finishing facility to assure single source responsibility and quality control.

C. Installer Qualifications:
   1. Installers shall have a minimum of five (5) years of experience installing systems of similar type and scope as those specified in this section.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. All materials shall be protected during fabrication, shipment and installation to prevent damage to the finished work from other trades.

B. To avoid lasting deformation of the Mullion Mate® Pro Extruded Aluminum Partition Gap Closure components when exposed to temperature and humidity extremes, store this material at or near room temperature. Allow a minimum of 48 hours for the product to adjust to internal room temperature and humidity conditions before installing the Mullion Mate® Pro Extruded Aluminum Partition Gap Closure.

C. Store Mullion Mate® Pro Extruded Aluminum Partition Gap Closures inside a well-ventilated area, away from uncured concrete and masonry, and protected from the weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

D. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommend by Manufacturer for optimum results. Do not install products under environmental conditions outside Manufacturer's recommendations.

E. Exercise care in loading, unloading, storing and installing units so as to preclude bending, warping, twisting and other surface damage.

1.08 WARRANTY:

A. Standard Warranty:

1. Furnish Manufacturer's Standard Warranty of one (1) year for workmanship and for finish against defects in materials and/or workmanship.

1.09 SUBSTITUTIONS:

A. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00.

PART 2 - PRODUCTS

11.01 2.01 MANUFACTURERS:

A. Basis-of-Design: Subject to compliance with requirements, provide Mullion Mate® Pro Extruded Aluminum Partition Gap Closures manufactured by Gordon, Inc. For all inquiries contact:
   1. Gordon, Inc.
   2. 5023 Hazel Jones Road
   3. Bossier City, LA 71111,
   4. sales@mullionmate.com

B. The listed Manufacturer shall not be construed as closing specifications to other prospective Manufacturers, but rather as establishing a level of quality in a metal system. Other systems may be submitted for approval, as provided for in the specifications at least ten (10) working days prior to submission of bids.

2.02 MATERIALS:

A. Provide metals free from surface blemishes where exposed to view in finished Mullion Mate® Pro Extruded Aluminum Partition Gap Closures. Surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished Mullion Mate® Pro Extruded Aluminum Partition Gap Closures are not acceptable. All metal shall be of the highest commercial grade available.

B. Mullion Mate® Pro Extruded Aluminum Partition Gap Closures are factory-assembled, and spring loaded to provide a tight fit for vertical junctures of partitions and window walls.

C. Materials:
   1. Aluminum extrusions: 6063-T5 or T6 temper alloy.
   2. Aluminum sheet, 3000 series alloy.

2.03 FABRICATION:

A. Provide Extruded Aluminum Mullion Mate® Pro Extruded Aluminum Partition Gap Closures in specified lengths and size to fit specified openings.
   1. Mullion Mate® Pro - 5.5 for openings 5.5"– 6-15/16".
      a. Single-Piece construction available in lengths up to sixteen (16) feet. Spliced conditions are available in lengths up to thirty (30) feet.

B. Provide Mullion Mate® End Caps in ten (10) foot lengths and widths to fit specified wall conditions.
   1. Mullion Mate® End Caps –
      a. MMEC-375 for 3-3/4" walls.
      b. MMEC-487 for 4-7/8" walls.
      c. MMEC-600 for 6" walls.
      d. MMEC-725 for 7-1/4".
      e. MMECBF-518 for 5-1/8" walls.
      f. MMECBF-514 for 5-1/4" walls.
      g. MMECBF-512 for 5-1/2" walls.
      h. MMECBF-812 for 8-1/2" walls.

C. Caulk for Mullion Mate® Pro Extruded Aluminum Partition Gap Closures is to be specified as follows:
   1. ASTM C920 Type S, Grade NS, Class 35, Use NT, G, A.
   2. Federal Specification TT-S-00230C Type II, Class A.

a. NSF Nonfood Compounds Category Code P1.

2.04 FINISHES:

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. All material shall be Field Paintable.

PART 3 - EXECUTION

15.01 3.01 EXAMINATION:

A. Examination of Surfaces: Installer must examine conditions under which work is to be performed and must notify Contractor in writing of unsatisfactory conditions.

B. Verify that field measurements and block-out dimensions are as shown on Shop Drawings.

3.02 PREPARATION:

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the Manufacturer to achieve the best result for the project conditions.

C. To avoid lasting deformation of the Mullion Mate® Pro Extruded Aluminum Partition Gap Closures components when exposed to temperature and humidity extremes, store this material at or near room temperature. Allow a minimum of 48 hours for the product to adjust to internal room temperature and humidity conditions before installing the Mullion Mate® Pro Extruded Aluminum Partition Gap Closures.

3.03 INSTALLATION:

A. General: Comply with Manufacturer's printed instructions, governing regulations for Seismic Codes, and any other regulations applicable to work.

B. Space Enclosure: Do not install any work until space is enclosed and weatherproofed, wet-work in space is completed and nominally dry, work above ceilings is complete, and temperature and humidity shall be continuously maintained at values near those of final occupancy.

3.04 CLEANING:

A. Follow Manufacturer's cleaning instructions for specified finish.

3.05 PROTECTION:

A. Procedures: Advise the Contractor of procedures required to protect the finished work from damage during the remainder of the construction period.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Ceramic accessories.

D. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 092116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.

B. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

C. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

D. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.

E. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

F. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

G. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's Qualification Statement:

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

A. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers:
   1. Ceramic Tileworks: www.ceramictileworksmn.com.
   2. MSI Surfaces: www.msisurfaces.com..
   3. WOW Tiles: www.wowdesigneu.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Porcelain Wall Tile : ANSI A137.1, and as follows:
   1. Moisture Absorption: 0 to 0.5 percent.
   2. Size and Shape: See Finish Legend.
   3. Surface Finish: See Finish Legend..
   4. Color(s): See Finish Legend..
   5. Pattern: See Finish Legend.
   6. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

C. Porcelain Floor Tile : ANSI A137.1, and as follows:
   1. Moisture Absorption: 0 to 0.5 percent.
   2. Size and Shape: See Finish Legend.
   3. Surface Finish: See Finish Legend.
   4. Color(s): See Finish Legend.
   5. Pattern: See Drawings.
   6. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: See Finish Schedule for finish, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Wall corners, outside and inside.
      c. Transition between floor finishes of different heights.
      d. Thresholds at door openings.

e. Expansion and control joints, floor and wall as indicated on Drawings.
f. Borders and other trim as indicated on drawings.

2. Manufacturers:
   a. Schluter-Systems: www.schluter.com/#sle.
   b. Genesis APS International: www.genesis-aps.com/#sle.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. LATICRETE International, Inc: www.laticrete.com/#sle.
   5. Merkrete, by Parex USA, Inc: www.merkrete.com/sle.
   6. ProSpec, an Oldcastle brand: www.prospec.com.

B. Provide setting materials made by the same manufacturer as grout.

C. Latex-Portland Cement Mortar Bond Coat: {rs#1}, {rs#1}.
   1. Products:
      a. ARDEX Engineered Cements; ARDEX X 77 MICROTEC: www.ardexamericas.com.
      b. AVM Industries, Inc; Thin-Set 780: www.avmindustries.com.
      c. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.
      d. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   3. Basis of Design: Mapei.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Standard Grout: ANSI A118.6 standard cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As selected from manufacturer's full range..
   4. Products:
      a. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com/#sle.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Color(s): As selected from manufacturer's full range..
   2. Products:
      a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

D. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.

2.05 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Thickness: 20 mils, maximum.
   2. Crack Resistance: No failure at 1/16 inch gap, minimum.

3. Products:
    a. LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
    1. Use uncoupling membrane under all tile unless other underlayment is indicated.
    2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.05 INSTALLATION - WALL TILE

A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components.

C. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit one samples each, 6 inches long, of suspension system main runner.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers: Basis of Design: Armstrong Ceiling Products
   1. Acoustic Ceiling Products, Inc.: www.acpideas.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Hunter Douglas Contract: www.hunterdouglascontract.com.
   4. USG: www.usg.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Panels Type ACT-1: Painted mineral fiber,ASTM E1264 Type XII with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Thickness: 7/8 inches.
   3. Composition: Formed Mineral Fiber.
   4. NRC: .80.
   5. Articulation Class (AC): 190, determined in accordance with ASTM E1264.
   6. Edge: Beveled Tegular.
   7. Surface Color: White.
   8. Products:
      a. Basis of Design: Ultima Tegular High NRC by Armstrong.
      b. Substitutions: See Section 016000 - Product Requirements.
   9. Suspension System: Exposed grid.

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Acoustic Ceiling Products, Inc.: www.acpideas.com.
   3. CertainTeed Corporation: www.certainteed.com.
   4. Chicago Metallic Corporation: www.chicagometallic.com.
   5. Hunter Douglas Contract: www.hunterdouglascontract.com.
   6. USG: www.usg.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 9/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.
   4. Products:
      a. Basis of Design: Suprafine 9/16" by Armstrong.
      b. Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same material and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2023.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

E. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Wall Base: 2% of linear feetof each type and color.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years experience and approved by flooring manufacturer.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for resilient stage floor to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

1.08 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Plank: LVT-1 Printed film type, with transparent or translucent wear layer, and:
   1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   2. Size: 7" x 47"
   3. Wear Layer Thickness: .020 inch.
   4. Total Thickness: .098 inch.
   5. Install Pattern: Staggered.
   6. Color: As indicated on Drawings.
   7. Manufacturers:
      a. Basis of Design: Shaw Contract Abide
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RESILIENT BASE

A. Resilient Base - Type RB-1: ASTM F1861, Type TV, vinyl, thermoplastic; top set Style B, Cove.
   1. Height: 4 inch.
   2. Thickness: 0.125 inch.
   3. Finish: Matte.
   4. Color: See Finish Schedule.
   5. Manufacturers: Basis of Design: Flexco
      a. Burke Flooring: www.burkemercer.com.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, loose laid with edges and control grid adhered.

1.02 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

C. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2011.

D. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints and location of edge moldings.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Interface, Inc: www.interfaceinc.com/#sle.
   2. Shaw Contract Group
   3. Bentley
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1, CPT-2, CPT-3, CPT-4, WOC-1_____,manufactured in one color dye lot.
   1. Product: See Finish Legend for style, color, size, and install pattern.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in patterns indicated on Finish Schedule.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and prime painting.

B. Wall covering.

1.02 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

C. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 6 by 6 inch in size illustrating color, finish, and texture.

E. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Wall Covering Materials: 10% of each color and pattern of wall covering; store where directed.
   3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Coverings:
   1. Momentum Textiles.
   2. Unika Vaev.

3. Substitutions: See Section016000-Product Requirements.

2.02 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Wall Covering - Type WC-1 thru WC-2: Roll stock:
   1. Wall Covering Products: See Finish Legend for style, color, size, and install pattern.

C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

D. Termination Trim: Extruded plastic, color as selected.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

F. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

C. Butt edges tightly.

D. Overlap adjacent panels as recommended by manufacturer.

E. Horizontal seams are not acceptable.

F. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

G. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

H. Do not install wall covering more than 1/4 inch below top of resilient base.

I. Cover spaces above and below windows, above doors, in pattern sequence from roll.

J. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

K. Install termination trim.

L. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

1.02 RELATED REQUIREMENTS

A. Section 012300 - Alternates: Alernates apply to materials specified in this section.

B. Section 095100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

D. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

1.07 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional mock-up requirements.

B. Construct mock-up of acoustical units at location as indicated by Architect.
   1. Minimum mock-up dimensions; 96 by 96 inches.
   2. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.01 WOOD VENEER SOUND-ABSORBING UNITS (WDP-1)

A. Manufacturers:
   1. Micro-Perforated Wood Ceiling and Wall System, by Redbud Architectural Systems. www.redbudasi.com.

2. Substitutions: See Section 016000 - Product Requirements.

B. Wood Veneer Acoustical Panels for Walls and Ceilings: Medium density fiberboard (MDF) core panels with prime grade, finished face veneer and nonwoven acoustical fabric adhered to back of panel.
   1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   2. Sound Absorption: Noise Reduction Coefficient (NRC) or Sound Absorption Average (SAA) of 0.70 to 0.80 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
   3. Acoustic Back-Up Material: Compressed fiberglass board, 1.5 lbs/cu ft density, in sizes to fit furring applications.
      a. Thickness: As required to comply with NRC requirements indicated.
   4. Panel Size: See Drawings.
   5. Panel Thickness: 1 inch.
   6. Provide MDF with no added urea formaldehyde (NAUF).
   7. Surface Veneer Species: Custom to match architect sample.
      a. Grain Direction: Vertical.
      b. Factory Finish: Custom stain to match architect sample with clear lacquer topcoat.
      c. Edge Banding: To match veneer species and finish.
   8. Perforated Panel: Offset .
      a. Hole Diameter: 0.5mm, nominal.
   9. Mounting: Use Zee clips anchored to wall substrate.
      a. Edge Profile: Square.

2.02 FIBERGLASS SOUND-ABSORBING UNITS (WP-1)

A. Manufacturers:
   1. Basis of Design: G&S Acoustics, Pinta Wall Panels. www.gsacoustics.com .
   2. Substitutions: See Section 016000 - Product Requirements.

B. Painted Wall Panels: Pinta panels; core of 6 to 7 pcf fiberglass, with chemically hardened edges and a paintable scrim fiber facing sheet.
   1. Core Thickness: 1 inch; NRC of 0.85.
   2. Size: As indicated on Drawings.
   3. Color: Sherwin Williams White Heron, SW 7627.
   4. Edges: Square and painted.
   5. Corners: Square.
   6. Wall Panel Mounting: Angled Impaling clips.
      a. Manufacturer's standard 3 by 4 inches mounting clips designed for impaling back of fiberglass units.

2.03 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

B. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

2.04 ACCESSORIES

A. Spline-Mounting Accessories: Manufacturer's standard concealed connecting splines of extruded aluminum designed for screw attachment to walls, with coordinating moldings and trim for interior and exterior corners and miscellaneous conditions.
   1. Color of Exposed Trim: To match fabric.

B. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal:

1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.
2. Metal impaling clips designed to support full weight of panels, mechanically attached to substrate and adhesively bonded to back of panels.

C. Trim Moldings: Manufacturer's standard wood or vinyl trim moldings for concealing panel joints; color to match panel.

D. Fixing Clips: Manufacturers standard for application as indicated.

E. Furring Strips: 1 by 2 inch wood furring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Furring Mounted Wood Veneer Panels:
1. For horizontal panel layout, attach furring strip vertically providing 1 inch clearance along length of strip from end walls.
2. For vertical panel layout, attach furring strip horizontally providing 1 inch clearance along length of strip from floor and ceiling.
3. Install furring strip along meeting edges of adjacent panels to ensure they are attached to same furring strip along abutted edge; 24 inch on center, maximum.
4. Install acoustic back-up material between furring as required for application.
5. Adhere first panel from edge to furring strip, and attach subsequent panels using fixing clips.

E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
1. Plumb and level.
2. Flatness.
3. Width of joints.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

C. Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by Owner.

END OF SECTION

SECTION 099000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, and insulated and exposed ducts, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section - : Shop-primed items.

1.03 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

1.04 SUBMITTALS

A. See Section , for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit paper "draw down" samples, in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on applicable substrate, 4 x 8 inch in size.

E. Manufacturer's Instructions: Indicate .

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of and a maximum of , in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Diamond Vogel Paints: www.diamondvogel.com/#sle.
   2. Duron, Inc: www.duron.com/#sle.
   3. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
   4. Benjamin Moore & Co: www.benjaminmoore.com/#sle.
   5. PPG Paints: www.ppgpaints.com/#sle.
   6. Pratt & Lambert Paints: www.prattandlambert.com/#sle.
   7. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Transparent Finishes:
   1. Base Manufacturer: Old Masters.

D. Primer Sealers: Same manufacturer as top coats.

E. Block Fillers: Same manufacturer as top coats.

F. Substitutions:

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Flammability: Comply with code for surface burning characteristics.

D. Colors:
   1. , finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint WE-OP-2A - Wood, Semi-solid, Alkyd/Linseed Oil, 2 Coat:
   1. One coat of Woodluxe Wood Brightener & Neutralizer primer sealer.
   2. Matte: One coat of alkyd/oil; Woodluxe Semi-Solid 593.
   3. Color: Darker stain, custom color to match Architect's sample.

B. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

A. All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including .
   1. and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
   3. Eggshell: MPI gloss level 3; use this sheen .
   4. Primer(s): As recommended by manufacturer of top coats.

B. Medium Duty Vertical/Overhead: Including .
   1. Applications: Restrooms.
   2. and one coat primer.
   3. Eggshell: MPI gloss level 3; use this sheen .
   4. Top Coat Product(s):
      a. Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy. (MPI #139, 141, 151, 153)
   5. Primer(s): As recommended by manufacturer of top coats.

C. Transparent Finish on Concrete Floors, Unless Otherwise Indicated:
   1. 2 coats sealer.
   2. Sealer: Water Based for Concrete Floors.
   3. Eggshell: MPI gloss level 3; use this sheen .
   4. Sealer Product(s):
      a. Behr Premium Wet-Look Sealer [No. 985]. (MPI #99)

D. Wood, Transparent, Varnish, No Stain:
   1. One coat .
   2. Satin: One coat of varnish; Masters Armor by Old Masters.

E. Wood, Transparent, Varnish, Stain:
   1. Two coats of stain; to match PL-1, WilsonArt Natural Recon, 7996..
   2. One coat

F. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with .
   2. Semi-gloss: Two coats of alkyd enamel.

G. Paint MgI-OP-3A - Galvanized Metals, Water-based light industrial coating over waterbourne primer system MPI INT 5.3K, 3 Coat:
   1. Prime Coat: Latex, fire-retardant, matching topcoat.
   2. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.

3. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss level 5), MPI #153.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: filler.

C. Fastener Head Cover Material: filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: percent.
   3. Interior Wood: percent, measured in accordance with ASTM D4442.
   4. Exterior Wood: percent, measured in accordance with ASTM D4442.
   5. Concrete Floors and Traffic Surfaces: percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of and bleach. Rinse with clean water and allow surface to dry.

F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution,

ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

N. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

O. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's instructions.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 101100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2025.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Manufacturers:
      a. AJW Architectural Products; ____: www.ajw.com/#sle.
      b. ASI Visual Display Products; _____: www.asi-visualdisplayproducts.com/#sle.
      c. Claridge Products and Equipment, Inc; ____: www.claridgeproducts.com/#sle.
      d. Nelson Adams NACO; ____: www.nelsonadamsnaco.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Color: White.
   3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
   4. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   5. Backing: Aluminum foil, laminated to core.
   6. Height: 48 inches.
   7. Length: 6 feet , in one piece.
   8. Frame: Extruded aluminum , with concealed fasteners.
   9. Frame Finish: Anodized, natural.
   10. Accessories: Provide marker tray.

2.02 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

2.03 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Logo sign.

C. Dimensional letter signs.

D. Plaque.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs: Basis of Design: Inpro corporation Santa Cruz Collection with back plate.

1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
2. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com/#sle.

3. Inpro: www.inprocorp.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Dimensional Letter Signs:
1. A.R.K. Ramos Architectural Signage Systems; Cast Aluminum Letters: www.arkramos.com/#sle.
2. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
3. FASTSIGNS: www.fastsigns.com/#sle.
4. Inpro: www.inprocorp.com.
5. Substitutions: See Section 016000 - Product Requirements.

C. Plaques:
1. A.R.K. Ramos Architectural Signage Systems; Cast Bronze Plaque: www.arkramos.com/#sle.
2. Trademarks; Cast Bronze: www.lettersandsigns.com.
3. FASTSIGNS; _____: www.fastsigns.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
1. Sign Type: Flat signs with engraved panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
3. Character Height: 1 inch.
4. Sign Height: 2 inches, unless otherwise indicated.
5. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings ; in addition, provide "window" section for replaceable occupant name.
6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
7. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.
8. Provide blank back panels for signs mounted to glass.

C. Building Identification Signs:
1. Use individual vinyl letters.
2. Mount on outside wall in location shown on drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media in aluminum frame.
1. Corners: Square.
2. Frame Finish: dark bronze anodized.
3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: To be selected from manufacturers full range of colors.
4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
1. Total Thickness: 1/8 inch.
2. Letter Thickness: 1/8 inch.
3. Letter Edges: Square.

2.05 PLAQUES

A. Metal Plaques:
   1. Metal: Bronze casting.
   2. Content and Location: To be determined during construction.
   3. Depth: 3/4".
   4. Size: 24 inches by 36 inches.
   5. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Color: Contrast with background color.
   6. Border Style: As selected by Architect from manufacturer's standard borders.
   7. Background Texture: Matte.
   8. Surface Finish: Brushed, satin.
   9. Protective Coating: Manufacturer's standard clear coating.
   10. Mounting: Blind studs.

2.06 DIMENSIONAL SIGN

A. Logo Sign:
   1. Metal: F-6M Aluminum: Medium bronze 312 duranodic..
   2. Metal Thickness: 1/8 inch minimum.
   3. Size: 48 inch diameter..
   4. Depth: 1 inch.
   5. Backlit: LED halo effect backlighting with a lexan back.
   6. Product: A.R.K. Ramos, Fabricated Reverse Channel Letters.
   7. Substitutions: Section 016000 - Product Requirements.
   8. Mounting: PM-1, Projected mount with collars and threaded studs set in adhesive.

B. Dimensional Letters:
   1. Metal: F-6M Aluminum: Medium bronze 312 duranodic.
   2. Metal thickness: 1/8" minimum.
   3. Height: 24 inches.
   4. Depth: 2 inches.
   5. Text: Standard Font
   6. Product: A.R.K. Ramos, Fabricated Reverse Channel Letters.
   7. Substitutions: Section 016000 - A.R.K. Ramos, Fabricated Reverse Channel Letters.
   8. Mounting: PM-1, Projected mount with collars and threaded studs set in adhesive.

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
   2. If no location is indicated obtain Owner's instructions.

D. Protect from damage until Substantial Completion; repair or replace damage items.

SECTION 102113.16
PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic laminate toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

D. PS 1 - Structural Plywood; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 6 by 6 inches in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Laminate Toilet Compartments:
   1. ASI Global Partitions; Moisture Guard: www.asi-globalpartitions.com/#sle.
   2. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

2.03 COMPONENTS

A. Toilet Compartments: Plastic laminate finished, floor-mounted headrail-braced.

B. Doors, Panels, and Pilasters: Plastic laminate adhesive and pressure bonded to faces and edges of particleboard core, with beveled corners and edges; edges of cut-outs sealed.
   1. Reinforce pilasters and panels with steel plate sandwiched in particleboard core at attachment points. Router cut openings as required.
   2. Plastic Laminate Color: Single color as selected.

C. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Door Width: 30 inches.
   3. Door Width for Handicapped Use: 36 inches, outswinging.
   4. Height: 58 inches.
   5. Thickness of Pilasters: 1-1/4 inches.

D. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of tubular headrail stock and sockets anchored to floor and ceiling.

2.04 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No.4 finish, 3 inches high, concealing floor fastenings.

B. Head Rails: Hollow anodized aluminum tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Pilaster Brackets: Polished stainless steel.

D. Wall Brackets: Continuous type, polished stainless steel.

E. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.

F. Hardware: Polished stainless steel:
   1. Continuous type, adjustable for door close positioning; two per door.
   2. Thumb turn door latch with exterior emergency access feature.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.
   5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

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

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 092116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, 24 inches long.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Inpro Corporation; Flexible Corner Guards: www.inprocorp.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: High impact vinyl.
   2. Thickness: .110 inch.
   3. Width of Wings: 1-1/2 inches.
   4. Corner: Radiused.
   5. Color: As indicated.
   6. Length: One piece, 48 inches.
   7. Mounting: Field applied heavy-duty adhesive..

B. Adhesives and Primers: As recommended by manufacturer.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

3.03 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 102641
BALLISTICS RESISTANT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laminated fiberglass ballistics-resistant panels.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood framing to receive ballistics-resistant panels.

1.03 ABBREVIATIONS AND ACRONYMS

A. AR: Abrasion Resistant.

B. BHN: Brinell Hardness Number.

C. UHMWPE: Ultra High Molecular Weight Polyethylene.

1.04 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

C. ISO 9001 - Quality Management Systems — Requirements; 2026.

D. MIL-DTL-12560 - Armor Plate, Steel, Wrought, Homogenous (for Use in Combat-Vehicles and for Ammunition Testing); 2025l, with Amendment (2026).

E. MIL-DTL-46027 - Armor Plate, Aluminum Alloy, Weldable 5083, 5456, & 5059; 2024n, with Amendment (2025).

F. MIL-DTL-46100 - Armor Plate, Steel, Wrought, High-Hardness; 2026f.

G. MIL-DTL-46177 - Armor, Steel Plate and Sheet, Wrought, Homogeneous (1/8 To Less Than 1/4 Inch Thick); 1998c (Validated 2024).

H. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials; 1985.

I. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's current data sheets on each product to be used.

C. Shop Drawings: Details of installation of ballistics-resistant panels, including plan views, elevations, sections, and details of the proposed installation with attachment methods.

D. Samples: Submit two samples, minimum size 6 inches by 6 inches, for each product specified.

E. Certificates: Submit printed data to indicate compliance with following requirements.
   1. UL Listing verification and UL 752 Current Test Results as provided by Underwriters Laboratories.
   2. Third party ballistic laboratory test report to confirm UL 752 level of protection.

F. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name, manufacturer's identification, and required UL and NIJ certification labels until ready for installation.

B. Handle material with care to prevent damage. Stack panels flat, store inside under cover off the ground in a dry location, and protect from other construction activities.

1.09 FIELD CONDITIONS

A. Install products under environmental conditions (temperature, humidity, and ventilation) recommended by manufacturer.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide ten year manufacturer warranty for materials and workmanship against defects commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laminated Glass Fiber Ballistics-Resistant Panels:
   1. ArmorCore by Waco Composites: www.armorcore.com/#sle.
   2. Armortex: www.armortex.com/#sle.
   3. Clear Armor, LLC; CLEAR ARMOR BALLISTIC BOARDS: www.clear-armor.com/#sle.
   4. Insulgard Security Products: www.insulgard.com/#sle.
   5. Total Security Solutions: www.tssbulletproof.com/#sle.
   6. U.S. Bullet Proofing; USFA Fiberglass Wall Armor: www.usbulletproofing.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 LAMINATED FIBER BALLISTICS-RESISTANT PANELS

A. General:
   1. Laminated fiber ballistics-resistant panels to be non-ricochet type. When struck by a bullet or projectile, the panels to delaminate in such a way that absorbs the energy, stops the projectile, and prevents ricochet or spalling.

B. Performance Requirements:
   1. Ballistics Resistance Rating: Listed and labeled as tested in accordance with UL 752 Level 1 (medium-power handgun) threat rating.
   2. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when tested in accordance with ASTM E84.

C. Laminated Fiber Panels:
   1. Material: Multiple layers of fiberglass woven roving bonded together with resin and compressed into flat rigid sheets.
   2. Panel Size: Maximum size to limit number of seams.
   3. Panel Thickness: Minimum thickness required for selected UL 752 threat level.
   4. Panel Weight: Minimum weight required for selected UL 752 threat level.
   5. Attachment Method: Mechanical fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation of this work.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install panels in accordance with manufacturer's instructions and shop drawings and in proper relationship with adjacent construction.
   1. Maintain ballistics-resistive rating at panel junctures with concrete floor and roof slabs, bullet-resistive door and window frames, and required penetrations.

B. Reinforce panel joints with a minimum 4 inch wide back-up layer of ballistics-resistant material, centered on panel joints.

C. Secure panels using screws, bolts, or industrial adhesive.

3.04 PROTECTION

A. Protect installed panels from subsequent construction operations.

B. Touch-up, repair or replace damaged panels before Date of Substantial Completion.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Accessories for toilet rooms and utility rooms.

C. Utility room accessories.

D. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 088300 - Mirrors: Other mirrors.

B. Section 102113.16 - Plastic-Laminate-Clad Toilet Compartments.

C. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com.
   2. ASI - American Specialties, Inc: www.americanspecialties.com.
   3. Bradley Corporation: www.bradleycorp.com.
   4. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

E. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Holder: Double roll, surface-mounted, tumbler lock.
   1. Finish: Satin-Finish Stainless Steel.
   2. Products:
      a. Bobrick B-2888..
      b. Substitutions: Section 016000 - Product Requirements.

B. Combination Towel Dispenser/Waste Receptacle: Recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges, ____.
   1. Towel dispenser capacity: 400 C-fold.
   2. Waste receptacle capacity: 2 gallons.
   3. Products:
      a. Substitutions: Section 016000 - Product Requirements.

C. Soap Dispenser: Liquid soap dispenser, deck-mounted on vanity, with polyethylene container concealed below deck; piston and 4 inch spout of stainless steel with matte black finish.
   1. Minimum Capacity: 16 ounces.
   2. Products:
      a. Kohler K-35761-BL.
      b. Substitutions: Section 016000 - Product Requirements.

D. Mirrors: 1/4 inch thick annealed float glass; ASTM C1036.
   1. Size: 18 x 36 inches.
   2. Color: Matte black
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   4. Products:
      a. Bobrick B-290.MBLK.
      b. Substitutions: Section 016000 - Product Requirements.

E. Mirrors: 1/4 inch thick annealed float glass; ASTM C1036.
   1. Size: 18 x 36 inches.
   2. Frame finish: Satin Finish Stainless Steel.
   3. Type: Welded frame.
   4. Products:
      a. Bobrick B-2908.
      b. Substitutions: Section 016000 - Product Requirements.

F. Grab Bars:
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.

d. Length and Configuration: As indicated on drawings.
e. Products:
1) Bobrick B-5806 Series.
2) Substitutions: Section 016000 - Product Requirements.

G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Color: To be selected from manufacturer's full line.
2. Products:
a. Bobrick B-254.
b. Substitutions: Section 016000 - Product Requirements.

2.05 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
1. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
2. Length: 36 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
1. Grab Bars: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 102814
ADULT CHANGING STATIONS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Adult Changing Stations, Adjustable Height:

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough carpentry, blocking in walls.

B. Section 092100 - Plaster and gypsum board assemblies, blocking in walls.

C. Section 093000 - Tiling, coordination with tile layout and installation.

D. Section 102800 - Toilet, bath, and laundry accessories.

E. Section 260000 – Electrical service installation.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for each product specified, including the following.
   1. Installation instructions and recommendations, including templates and rough-in measurements.
   2. Storage and handling requirements and recommendations.
   3. Cleaning and maintenance instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 5 years successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA, ICC A117.1 International Building Code (IBC), and state building code requirements as applicable.

D. Manufacturing Location: United Kingdom

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.06 WARRANTY

A. Manufacturer’s Warranties: Submit manufacturer’s standard 3 year warranty for materials and workmanship.

PART 2: PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Koala Kare Products, a Division of Bobrick, www.koalabear.com.

B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual.

2.02 ADULT CHANGING STATIONS, HEIGHT-ADJUSTABLE

A. Surface-Mounted Adjustable Height Changing Station :
   1. Basis of Design: Model KB3000-AHL as manufactured by Koala Kare Products, a Division of Bobrick.

2. Powered-Height Adjustability: Changing surface shall electronically adjust from 12” (300mm) to 41” (1,041mm) from floor.
3. Unit shall have two sets of built-in electronic controls for height adjustment. One located on face of wall cover and one on the front of changing surface.
4. Changing Surface shall be polyethylene and meet IK10 standard for resistance to high impact and sharp objects.
5. Back-Up Battery: Unit shall have a built-in backup battery system that allows for continuous operation in the event of a power interruption.
6. Emergency Stop: Unit shall include a wall-mounted emergency stop to break power to actuator.
7. Changing Surface shall be a minimum 75 ¼” (1,911mm) long, and 31 ½” (800mm) wide, and can be opened and closed with one-hand.
8. Unit shall have a safety rail with a curved dip in the center for easier patient changing by caregiver. Safety rail rotates and locks under changing bed when in closed position.
9. Unit shall withstand significant exposure to water without damage to electrical components. It shall include a grounded power cord and have a splash-proof control system. Electrical components and wiring shall not come in contact with station users or caregivers.
10. Changing surface shall not have covered areas to help ensure cleanliness.
11. Unit shall have ISO 60601-1 and -2 whole product certification.
12. Durability: Cycle tested through range of motion 28,000 times at 500lbs. Stress tested to 100,000 cycles with 500lbs. bounce load test.
13. Frame shall be constructed of 2” powder coated steel tubing.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install products in strict compliance with manufacturer’s written instructions and recommendations, including the following:
   1. Verify wall blocking has been installed properly.
   2. Verify required electrical services have been installed properly.
   3. Verify wall location does not interfere with door swings or use of fixtures.
   4. Use fasteners and anchors suitable for wall substrate and project conditions.
   5. Install units at location and height indicated on the drawings.
   6. Install units level, plumb, and in proper relationship with adjacent construction.
   7. Adjust for proper operation.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   3. Nystrom, Inc: www.nystrom.com/#sle.
   4. Potter-Roemer: www.potterroemer.com/#sle.
   5. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
   6. Strike First Corporation of America; Water Fire Extinguisher: www.strikefirstusa.com.
   7. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories: Basis of Design: JL Industries Academy Series with rolled edge.
   1. Ansul, a Tyco Business: www.ansul.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   3. Nystrom, Inc: www.nystrom.com/#sle.
   4. Potter-Roemer: www.potterroemer.com/#sle.
   5. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
   6. Strike First Corporation of America: www.strikefirstusa.com.
   7. _____.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 10 pound.
   3. Finish: Baked polyester powder coat Red color.
   4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed aluminum.

B. Cabinet Configuration: Semi-recessed types.
   1. Size to accommodate accessories.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

D. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Dark Anodized Aluminum.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: FIRE EXTINGUISHER.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 48 inches maximum from finished floor to center of pull.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.03 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

3.04 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

END OF SECTION

SECTION 115213
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking in walls and ceilings.

B. Section 092116 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.

C. Section 260583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Samples: For screen fabrics, submit two samples 6 by 6 inch in size.

E. Samples: For case and frame finishes, submit two samples 6 by 6 inch in size, illustrating color and texture of finish.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

A. Manufacturers:
   1. Basis of Design: Ultimate Access E Electric Projection Screen by Draper, Inc.: www.draper.com

B. Front Projection Screens: Factory assembled unless otherwise indicated.
   1. Located in Community room 123: Motorized, matte light diffusing fabric screen, horizontally tensioned, ceiling recessed.
      a. Screen Dimensions: 120 inch high by 144 inch wide.

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
   1. Material: High contrast gray vinyl on fiberglass backing, with nominal gain of 0.8 over viewing angle not less than 70 degrees from axis, horizontally and vertically.

D. Masking Borders: Black, on four sides.

E. Concealed-in-Ceiling Screen Cases: Steel, with integral roller brackets.
   1. Door Slat: Self trim; self-closing and -opening.
   2. Case Finish: Baked enamel.
   3. Case Color: White.
   4. End Caps: Steel; finished to match case.

F. Electrically-Operated Screens:
   1. Roller: Steel, 2 inch in diameter, with locking device.
   2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
   3. Horizontal Tensioning:

G. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.
   1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.
      a. Electrical Characteristics: 1.2 amps.
      b. Motor mounted on sound absorber.

C. Controls: Three (3) position control switch with plate.
   1. Provide two control stations to screen, with internal override to prevent more than one signal reaching the screen.
   2. Remote Control: Infrared; provide one transmitter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that openings for recessed screens are correctly sized.

D. Verify that entrances to installation area are sized to permit entry of rigid screen.

E. Verify type and location of electrical connections.

F. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Handle rigid screen materials with care to avoid damage. Use equipment only on uncoated side.

E. Install plumb and level.

F. Install electrically operated screens ready for connection to power and control systems by others.

G. When installing electrical masking, do not damage underlying screen.

H. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

I. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

B. Electric motor operators.

C. Motor controls.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 092116 - Gypsum Board Assemblies: Substrate for window shade systems.

C. Section 095100 - Acoustical Ceilings: Shade Pockets, pocket closures and accessories.

1.03 REFERENCE STANDARDS

A. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2019.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

F. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details and head, jamb and sill details.

D. Shop Drawings - Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

E. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.
   1. Motorized Shades: Include finish selections for controls.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

J. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: 25 years.
   2. Electric Motors: One year.
   3. Electronic Control Equipment: One year.
   4. Fabric: 25 years.
   5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manually operated and motoraized roller shades shall be provided from the same manufacturer.
   1. Manually Operated Roller Shades, mounted in ceiling head pocket.
      a. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
      b. Lutron Electronics Co., Inc: www.lutron.com/#sle.
      c. Levolor: www.levolor.com/commercial/#sle.
      d. Hunter Douglas: www.hunterdouglas.com.
      e. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
      f. Substitutions: See Section 016000 - Product Requirements.
   2. Motorized Roller Shades, Motors and Motor Controls: Basis of Design: The Shade Store, surfaced mounted.
      a. Draper, Inc; Motorized FlexShade: www.draperinc.com/#sle.
      b. Lutron Electronics Co., Inc; Sivoia QS Roller Shades: www.lutron.com/sle.
      c. SWFcontract, a division of Springs Window Fashions, LLC: www.swfcontract.com.

d. Substitutions: See Section 016000 - Product Requirements.

3. Shade Fabric:
   a. Mermet Corporation; GreenScreen Revive - 1% at manual and 5% at motorized: www.mermetusa.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

2.02 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled.
   1. Drop: Regular roll.
   2. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation; PVC-free; 100 percent recycled.
   1. Sheer Shades: Reduce glare yet still reveal considerable details to the outside; no privacy; Openness Factor greater than 1 percent.
   2. Privacy Shades: Soften the light yet still reveal some details to the outside; moderate privacy; Openness Factor approximately equal to 1 percent.
   3. Flammability: Pass NFPA 701 large and small tests.
   4. Fungal Resistance: No growth when tested according to ASTM G21.

C. Roller Tube: As required for type of operation, extruded aluminum with end caps.
   1. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
   2. Finish: Baked enamel; color from manufacturer's standards.

D. Hembars and Hembar Pockets: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.

E. Manual Operation: Clutch operated continuous loop; beaded ball chain.

F. Motor Operation: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed to UL 325.
   1. Audible Noise: Maximum 39 dBA measured 3 feet from the motor unit; no audible clicks when motor starts and stops.
   2. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view.
   3. Motor Type: AC, for direct hardwired connection to AC power source.
   4. Coupling of Multiple Shades: Where possible, minimize number of motors by coupling adjacent shades.
   5. Control Compatibility: Fully compatible with the controls to be installed.

2.03 MOTOR CONTROLS

A. Motorized shades to be controlled by wall-mounted controls as specified below.

B. Control Requirements:
   1. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
   2. Capable of assigning shades to groups and subgroups without rewiring.
   3. Capable of storing programmable stop points, including open, close, and any other position.
   4. Provide 10 year power failure memory for preset stops, open and close limits, shade grouping and subgrouping and system configuration.
   5. Capable of synchronizing multiple units of the same size to start, stop and move in unison.
   6. Provide all components and connections necessary to interface with other systems as indicated.

C. Wall-Mounted Controls: UV stabilized visible parts meeting ASTM D4674; furnished with backlit buttons; provided by shade manufacturer.
   1. Control Functions:
      a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
      b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
      c. Raise: Raise controlled shade(s) only while button is pressed.
      d. Lower: Lower controlled shade(s) only while button is pressed.
      e. Stop shade(s) in motion by tap on any button.
   2. Finish: To be selected by Architect.
   3. Button Engraving: Manufacturer's standard engraving, unless otherwise indicated.

2.04 ACCESSORIES

A. Fascias: Size as required to conceal shade mounting.
   1. Style: As selected by Architect from shade manufacturer’s full selection.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.05 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
   1. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Window Stools.

1.02 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework.

B. Section 224000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. ANSI A161.2 - Performance Standards for Fabricated High Pressure Decorative Laminate Countertops; 1998.

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2026.

G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

H. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

I. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

J. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

K. PS 1 - Structural Plywood; 2022.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops and Window Stools: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
         2) Dupont; Corian: www.corian.com/#sle.
         3) Formica Corporation: www.formica.com/#sle.
         4) Wilsonart; _____: www.wilsonart.com/#sle.
         5) Substitutions: See Section 016000 - Product Requirements.
      b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      c. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Skirts: As indicated on drawings.

C. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin self-supporting over structural members.
   1. Flat Sheet Thickness: 1-1/4 inch, minimum.
   2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Cambria Company LLC: www.cambriausa.com/#sle.
         2) Corian.
         3) Substitutions: See Section 016000 - Product Requirements.
      b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
      c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      d. Finish on Exposed Surfaces: Polished.
      e. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.

5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on drawings.
7. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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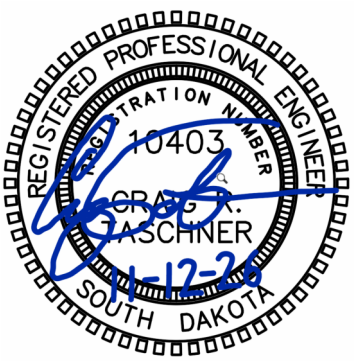
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PROJECT: HARRISBURG CITY HALL
HARRISBURG, SD

FEI NO: 262.263

DATE: November 12, 2026

Project Manual sections prepared by or under the supervision of Craig Taschner, Reg. No. 10403, include all sections of Division 21.



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DIVISION 21 - FIRE SUPPRESSION

SECTION 210100 - GENERAL PROVISIONS

1.1 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (DIVISION 1) are hereby made part of this Section.

This Section pertains to general provisions and requirements for construction of work specified in all sections of DIVISION 21 herein.

"Contractor" referred to in this Section of the specification implies the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the installation specified in DIVISION 21 and/or as shown on the Contract Drawings.

Where the specifications in subsequent Sections of DIVISION 21 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring and incidentals necessary to be installed in accordance with manufacturer's recommendations except as otherwise approved.

1.2 PERMITS AND SERVICE CHARGES:

All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

All work shall be executed in accordance with all local, state and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.3 CODES AND STANDARDS:

All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.

Local and State Codes, Standards and Regulations.
National Fire Protection Association (NFPA).
National Electric Code (NEC).
International Fire Code (IFC)
Underwriter's Laboratory (UL).
Uniform Plumbing Code.
International Mechanical Code.
American Waterworks Association (AWWA).
Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).
International Building Code.
Americans with Disabilities Act (ADA)

Harrisburg Policy Bulletins

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.4 COMPLIANCE:

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.5 DRAWINGS:

In general, the Drawings of the systems and equipment are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

Drawings of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

The Contractor and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.6 SUBSTITUTIONS AND PRODUCT OPTIONS:

The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least ten days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

1.7 SHOP DRAWINGS:

Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors.

To the extent practical, complete sets of shop drawings for each specification section shall be submitted. In the case that a particular item is required to be expedited, that particular item may be submitted individually.

Submit shop drawings punched in PDF format.

Furnish Shop Drawings as follows:

For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.

For all equipment, systems or devices where Shop Drawings are specifically called for.

For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.

The Contractor shall check all Shop Drawing submittals for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.

Shop Drawings will be reviewed by the Architect/Engineer and a review letter will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.

Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages as may be incurred to the structure as a result of the above correction shall be paid by this Contractor.

Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.

Hydraulic calculations proving the system is capable of providing the required design densities to accommodate the use and occupancy of each shall be performed by the contractor. The contractor is required to perform and submit hydraulic calculations as part of their submittal packages.

1.8 CLEANING:

The Contractor and/or Subcontractors for the various phases of the work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished under any or all contracts in a clean first class condition.

Surfaces of all mechanical equipment shall be wiped clean or washed if required, leaving the installation in a first class condition. All equipment shall be thoroughly cleaned of all plaster, stickers, rust stains, and other foreign matter or discoloration, leaving every part in a first class condition and ready for use.

1.9 PAINTING:

Painting of materials and equipment furnished under the mechanical portion of the contract shall be as described in DIVISION 9. Contractor shall refinish and restore to the original condition and appearance, all mechanical equipment which has sustained damage to the manufacturer's prime and finish coats of enamel or paint. Materials and workmanship shall be equal to the requirements described in DIVISION 9.

Where sprinkler heads are installed on exposed piping and in other locations where heads are susceptible to paint spray or over-spray, contractor shall cover sprinkler heads in preparation for painting.

1.10 RECORD DRAWINGS:

The Contractor shall keep a complete set of all drawings in the jobsite office for purpose of showing the installation of mechanical systems and equipment. This set of drawings shall be used for no other purpose. Where any equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall be clearly and neatly shown on this set of drawings using ink or indelible pencil. At the completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property. Record drawings may be inspected by the Architect/Engineer at site visits.

1.11 OPERATING INSTRUCTIONS:

The Contractor shall furnish the Owner two (2) sets of complete catalog data, manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division. All such literature shall be bound in an amply sized three-ring binder and submitted to the Architect/Engineer for approval and for eventual transmittal to the Owner. The manual shall have a Table of Contents at the front of the manual. Before producing hard copies of the manuals, verify with the General Contractor if electronic or hard copy versions of the manuals are to be submitted.

The Contractor shall also supervise the initial operation of all equipment and instruct the operator selected by the Owner in such operation as required to acquaint him thoroughly with the equipment.

1.12 DELIVERY AND STORAGE OF MATERIALS:

Make provisions for delivery and safe storage of materials on the jobsite and make arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered at such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected. All stored equipment shall be protected from the weather conditions and construction debris with a protective covering securely tied in place.

1.13 MECHANICAL PROVISIONS:

Mechanical equipment shall operate without objectionable noise or vibration, as determined by the Architect/Engineer. If such noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, or other parts of the work, make necessary changes and additions, as approved, without extra cost to Owner.

Provide oil level gauges, grease cups and grease gun fittings for machinery bearings as recommended by the manufacturer. Extend oil or grease fittings by copper tubing to readily accessible locations.

1.14 CONCRETE BASES:

Concrete bases are required for floor mounted mechanical equipment inside buildings and are specified in DIVISION 3. After bases are poured they shall set at least seven (7) days before mounting equipment. The Contractor shall coordinate the setting of expansion bolts in the bases for attachment of equipment and/or isolators.

This Contractor shall verify and coordinate the exact location of the bases and the exact size requirements for specific items of equipment.

Air compressors, pumps, tanks, and other floor mounted mechanical equipment shall be mounted on four inch (or as required) high concrete bases.

1.15 COORDINATION OF WORK:

The Contractor shall communicate with all other Contractors on this project and shall arrange his work in proper relation to the work of others. Work made necessary as a result of failure to coordinate with other Contractors shall be the responsibility of this contractor and shall first be

approved by the Architect/Engineer.

The Contractor shall process shop drawings and order equipment and materials expeditiously after receiving the Contract and the mechanical installation shall be substantially complete when the general construction work is completed. This Contractor shall confer and cooperate with all other Contractors on this project and shall arrange his work in proper relation to the work of others. Each Contractor shall furnish, install, and maintain in place all anchors, inserts, sleeves, etc., required for his work. Each Contractor will also be held solely responsible for proper size and location of all anchors, inserts, sleeves, chases, recesses, openings, bases, etc., required for proper installation of his work. All cutting and patching made necessary by failure or neglect to coordinate with other Contractors shall be the responsibility of this Contractor. Any cutting or patching shall be subject to the direction and approval of the Architect/Engineer and all damage due to cutting or patching shall be repaired by this Contractor.

After being instructed by this Contractor to do so, the General Contractor will leave all openings in roof, walls, floors, etc., for the passage of pipes, etc. The General Contractor shall also provide concrete bases and roof curbs where shown for mounting the mechanical equipment unless specified otherwise. This Contractor shall verify the exact size and location required for installation of his equipment with the General Contractor.

In general, the DIVISION 26 Electrical Contractor will provide all power wiring and make one power connection to each item of mechanical equipment, as outlined under Electrical Section.

1.16 GUARANTEE:

Refer to the requirements of the General Conditions of the Contract for Construction

All mechanical equipment including equipment used during construction for temporary purposes shall be guaranteed for a period of one year after the time of final acceptance of this work and shall be in like new condition at time of final acceptance.

1.17 TEMPORARY HEAT:

Refer to the requirements of Section 01500 – TEMPORARY FACILITIES.

1.18 ELECTRICAL:

Except where specifically described as being furnished as a part of the equipment furnished and installed under DIVISION 21, all electric power wiring shall be furnished and installed in DIVISION 26. The Electrical Contractor will make one power connection to each item of mechanical equipment, unless specified otherwise.

Electrical wiring furnished and installed under these specifications shall conform to all applicable requirements of DIVISION 26.

Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in accordance with the following schedule:

Item	DIVISION Furnished Under	Set in Place or Mounted Under	Wired & Connected Under
Equipment Motors	21	21	26

Horn Strobe Alarm	26	26	26
Fire protection controls	21	21	26
Fire and smoke detectors	26	26	26
Disconnect switches, thermal overload switches, manual operating switches	26	26	26
Control relays, transformers	21	21	26

All controls as noted on the Drawings and/or as specified in these specifications shall be provided by this Contractor, and wired and connected by the DIVISION 26 Contractor, unless specifically shown otherwise on the Drawings.

1.19 SLEEVES:

Any pipe passing through building construction including walls, floors, roofs or masonry partitions or as noted on the Drawings shall be encompassed with sleeves in accordance with the following:

All pipe sleeves through slabs, floors, masonry walls and masonry partitions shall be 1/2 inch greater in inside diameter than the external diameter of pipe passing through. Sleeves for insulated piping shall be large enough to accommodate the insulation without harming the insulation or vapor barrier. All sleeves shall be fabricated from new material cut square and reamed.

Sleeves shall be provided in all masonry partition walls including locations above suspended ceilings where masonry partition walls extend from floor slab to slab above. Sleeves shall be Schedule 40 steel pipe finishing flush with the wall surface.

Sleeves through exterior building walls shall be Schedule 40 steel pipe with welded flange in the middle of the sleeve and ends finishing flush with finished surfaces. Space between pipe and sleeve shall be packed to provide a watertight joint.

Sleeves through roof slabs and floor slabs in concealed locations shall be No. 22 gauge galvanized steel or crete sleeves (linear polyethylene). Concealed sleeves shall be considered as pipe sleeves in shafts, pipe chases and within walls and partitions.

Sleeves through floor slabs in exposed areas shall be Schedule 40 steel pipe and sleeves shall extend 1/4 inch above the finished floor surface. For slabs in equipment rooms and in other wet areas, sleeves shall be Schedule 40 steel pipe and shall extend 2 inches above finished floor surface.

Floor sleeves in membraned floors shall be furnished with flashing rings and clamps.

All sleeves in exposed locations, except equipment rooms, shall be set so plates specified will cover the sleeves.

All pipe sleeves where wet conditions exist, except sleeves through exterior walls, shall be caulked with a plastic caulking, including sleeves in concealed locations. The space between the pipe and the sleeves shall be caulked in both ends of sleeve, even with the ends of the sleeve. The sealer shall be suitable for temperatures from minus 50 degrees to 300 degrees, suitable for painting, non-corrosive and have good adhesion.

Sleeves in fire rated construction, equipment rooms, and/or where designated on the Drawings shall consist of schedule 40 steel pipe. Seal sleeves with a fire retardant sealant. When applied according to manufacturer's recommendations, sealant shall have a 3-hour U.L. fire rating.

All sleeves shall be set and maintained in place by this Contractor during the progress of the work. This Contractor shall be responsible for locating all sleeves at the proper location.

Sleeves are not required for core drilled masonry wall and floor holes, masonry wall and floor holes formed by polyethylene plastic (removable) sleeves, or for masonry holes made in another neat manner except in equipment rooms and other wet areas.

Sleeves are not required in metal or wood stud wall construction. Rated systems shall be provided as required to provide the necessary rating of the penetration.

1.20 FIRESTOPPING:

Refer to the requirements of Section 072700 - FIRESTOPPING.

Firestopping material shall have a rating resistance rating equal to or greater than the wall in the penetration exists that will be sealed with said firestopping.

Firestopping materials shall be 3M, Hilti, MetaCaulk, Nelson or equal.

1.21 WALL, FLOOR AND CEILING PLATES:

Furnish and install chrome-plated wall, floor and ceiling plates on all exposed pipes where they pass through walls, floors, or ceilings in finished areas. Finished areas shall be those areas which are painted or have special finishes within the room. The wall plates shall be a minimum of 3/32 inch thickness and shall have set screws or spring locks for clamping to the piping. The plates shall be chrome-plated steel, cast iron or brass and shall set tight against the wall.

1.22 ACCESS TO EQUIPMENT:

Access shall be provided to all motors, valves, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The location of the access openings relative to the equipment shall be coordinated to assure proper access to the equipment. The door shall maintain any ratings of the wall, ceiling, etc. that it penetrates.

Access openings are required for valves and other devices requiring access and shall be provided in the housings, tanks, walls, ceilings, etc., under this portion of the Contract.

1.23 PIPE AND PIPE FITTINGS:

All pipe and fittings shall be new and listed for fire protection use.

Furnish and install where shown on the Drawings and required for a complete system, pipe and fittings of type and material for the various services as noted below.

Piping not shown on the Drawings, which is obviously necessary for complete systems, shall be provided and shall be amply sized in accordance with applicable codes and standards.

Wet fire sprinkler system (water-filled) piping and deluge system (open-type) piping shall be ASTM A-135 standard-weight, black, Schedule 40 with factory or field formed threaded ends for sizes up to 2 inch size. Fittings used on threaded end piping shall be ASME B16.3 Class 300, ductile iron threaded fittings with NPT threads that conform to ANSI B1.20.1. Wet fire sprinkler piping shall be ASTM A-135 Schedule 10, black with factory or field formed roll-grooved ends for sizes 1-1/4" and greater. Grooved fittings shall be standard or short radius ASTM A-536, Grade 65-45-12, ductile iron fittings with cut-grooved ends and non-lead orange enamel coated. Grooved couplings shall include ductile iron, ASTM A-536, Grade 65-45-12, housings with non-lead orange enamel coatings, ASTM A-449 and ASTM A-183 bolts and nuts, and Grade "E" EPDM Type A gaskets. Grooved pipe outlets shall be tee-let, ASTM A-53, ANSI B1.20.1 threaded or cut groove, factory welded outlet fittings. Field installed outlets shall be permitted to be mechanical "T", bolted, ASTM A-536, orange enamel coated ductile iron, with ANSI B1.20.1 threaded or cut groove outlets, Grade "E" EPDM gaskets, and ASTM A-449 and ASTM A-183 bolts and nuts.

Interior dry fire sprinkler system (compressed air) piping and drain piping shall be ASTM A-135 standard-weight, Schedule 40 with factory or field formed threaded ends for sizes up to 2 inch size. Fittings used on threaded end piping shall be ASME B16.3 Class 300, ductile iron threaded fittings with NPT threads that conform to ANSI B1.20.1. Dry fire sprinkler piping shall be ASTM A-135 standard-weight, Schedule 40 with factory or field formed roll-grooved ends for sizes 1-1/4" and greater. Grooved fittings shall be standard or short radius ASTM A-536, Grade 65-45-12, ductile iron fittings with cut-grooved ends. Grooved couplings shall include ductile iron, ASTM A-536, Grade 65-45-12, housings, ASTM A-449 and ASTM A-183 bolts and nuts, and Grade "E" EPDM gaskets. Grooved pipe outlets shall be tee-let, ASTM A-53 ductile iron, and ANSI B1.20.1 threaded or cut groove factory welded outlet fittings. Factory or field installed outlets shall be permitted to be mechanical "T", bolted, ASTM A-536 ductile iron, with ANSI B1.20.1 threaded or cut groove outlets, Grade "E" EPDM gaskets, and ASTM A-449 and ASTM A-183 bolts and nuts.

Exterior dry fire sprinkler system (compressed air) piping and drain piping shall be ASTM A-135 standard-weight, ASTM A-123 hot dipped galvanized, Schedule 40 with factory or field formed threaded ends for sizes up to 2 inch size. Fittings used on threaded end piping shall be ASME B16.3 Class 300, ASTM A-153 hot dipped galvanized, ductile iron threaded fittings with NPT threads that conform to ANSI B1.20.1. Dry fire sprinkler piping shall be ASTM A-135 Schedule 40, ASTM A-123 hot dipped galvanized with factory or field formed roll-grooved ends for sizes 1-1/4" and greater. Grooved fittings shall be standard or short radius ASTM A-536, Grade 65-45-12, ductile iron fittings with cut-grooved ends and ASTM A-153 hot dipped galvanized coating. Grooved couplings shall include ductile iron, ASTM A-536, Grade 65-45-12, housings with ASTM A-153 hot dipped galvanized coating, ASTM A-449 and ASTM A-183 bolts and nuts, and Grade "E" EPDM gaskets. Grooved pipe outlets shall be tee-let, ASTM A-53 ductile iron, ASTM A-153 hot dipped galvanized , and ANSI B1.20.1 threaded or cut groove factory welded outlet fittings. Factory or field installed outlets shall be permitted to be mechanical "T", bolted, ASTM A-536 ductile iron, ASTM A-153 hot dipped galvanized , with ANSI B1.20.1 threaded or cut groove outlets, Grade "E" EPDM gaskets, and ASTM A-449 and ASTM A-183 bolts and nuts.

All piping that penetrates an exterior wall shall be galvanized Schedule 40 minimum.

Plastic CPVC Schedule 80 piping and fittings are not allowed for this installation.

Flexible piping is not allowed for this project where approved by its listing.

All welded outlet fittings shall be Merit, Island, or equal.

All flanged fittings shall be ductile iron per ASTM A536. Flanged fittings shall be Anvil, Star, or equal.

1.24 VALVES:

All valves shall be new and listed for fire protection use.

Furnish and install valves in piping where so indicated on the Drawings.

Of the several manufacturers listed, the Contractor is to standardize on one make as much as practical but not to the extent of sacrificing quality listed. Valves shall be Tyco, Milwaukee, Victaulic, Ames, Watts, Wilkins, or equal.

Butterfly valves shall be of the indicating type with two sets of factory installed internal supervisory switches. Valves shall be ductile iron conforming to ASTM A-395 with Grade EPDM "E" encapsulated rubber disc seals. Valves shall be Tyco, Victaulic, or Equal.

Outside Screw and Yoke (OS&Y) gate valves shall be ductile iron, raised face with bolted bonnets. Valve shall be Kennedy, Mueller, Nibco, Watts, or equal.

Ball Valves 1-1/2" and smaller shall be standard port, end entry valves with a brass valve body. The ball shall be chrome plated brass with a stainless steel stem. Valves shall be Watts, Nibco, Milwaukee, Victaulic, or equal.

1.25 PIPING CONNECTIONS:

Pipe connection shall be through the use of grooved couplings attached to roll or cut grooves on the piping, female threaded fittings screwed on to threaded end pipe, and flanged fittings with bolts, nuts and rubber gaskets. Mechanical joint couplings may be used only with the approval of the Fire Protection Engineer.

1.26 PIPE HANGERS, SUPPORTS AND ANCHORS:

Anchors and other attachments to the building structure shall be installed where designated and as detailed on the Drawings and specified herein and/or as required. The hangers shall adequately support the piping system. They shall be located near or at changes in piping direction and as otherwise required by NFPA 13. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping. Hangers shall bear directly on piping.

Pipe hangers shall not be attached to the roof deck. Hangers shall be attached to the structure with beam clamps, beam attachment and brackets bolted to joists and beams, wood lag bolts, steel self tapping screws, and any other approved means of attachment that is rated to support five time the weight of the water filled pipe plus 250 lbs of additional load.

Hanging from one pipe to another is prohibited.

All piping 1/2" through 8" shall be hung through the use of galvanized ring style band hangers with a knurled swivel nut.

3/8" all thread rod shall be used to attach the ring to the structural attachment device for pipe sizes 1/2" through 4", 1/2" all thread rod shall be used for pipe sizes 6" through 8", and 5/8" all thread rod shall be used for pipe sizes 10" through 12".

Rings shall be Tolco, Hilti, Anvil, or equal. Structural Attachments shall be Sammy, Tolco, Hilti, or equal.

1.27 PIPING INSTALLATION:

All pipes shall be round and straight, of required size. Cutting shall be done with proper tools and pipes shall be reamed to full size after cutting.

Piping shall be properly enclosed, supported, guided, anchored, sway braced, connected, tested, cleaned and flushed out and shall be properly protected, where required.

All pipes shall be run with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of the Architect/Engineer. Lines required to be enclosed in ceiling, chaseways or similar spaces shall be installed to permit such enclosure as intended. All pipe runs shall be carefully laid out and scheduled to avoid necessary interferences with other work. Pipe sizes shown on the Drawings are nominal pipe sizes and not outside diameters.

Pipes shall be run substantially as indicated on the Drawings. However, the Architect/Engineer reserves the right to require this Contractor to make changes in pipe locations where conflicts occur with other trades. Such changes shall be made without extra cost to the Owner.

Piping shall be installed with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Such provision shall be made by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Suitable anchors and guides shall be provided to permit proper deflection and compression of offset loops and expansion joints. Expansion joints shall not be used in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the Drawings or where otherwise obviously necessary.

Exposed piping shall be installed in a sanitary manner for ease in cleaning. Pipe shall be cut and threaded to fit the installation. Wherever possible, rough-in exposed pipe connections at the wall rather than the floor for ease in cleaning.

1.28 PRESSURE GAUGES:

Furnish and install U.S. Gauge Model 5105 or equal pressure gauges in pipelines and on equipment as indicated herein and/or where shown on the Drawings. Gauges shall have phosphor bronze bourdon tube with brass movement.

Gauges shall be compound, pressure or vacuum as required with 4-1/2 inch diameter dial. Each gauge shall be complete with Trerice No. 872 pressure snubbers, and brass ball valves.

The normal operating pressure of each gauge shall be 50-70 percent of full scale. The range of the scale shall be suitable for the application.

The gauges shall be located and mounted such that they can be conveniently read by a person standing on the equipment room floor. Accuracy shall be Grade "A". Case shall be aluminum.

Pressure gauges shall be U.S. Gauge, Trerice, Weksler, Ashcroft, Weiss or equal.

END OF SECTION 210100

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DIVISION 21 - FIRE SUPPRESSION

SECTION 210500 - FIRE SUPPRESSION

1.1 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (DIVISION 1) are hereby made part of this Section.

The Work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install a complete fire protection system as described herein and/or shown on the Drawings. This includes all piping, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

The fire protection system shall be a single zone wet-pipe and single zone dry-pipe system consisting of 2 total zones to protect the entire facility as defined by the plans. The system in office, commons, and lobby areas shall be designed for light hazardous classification. The storage and mechanical areas shall be designed for ordinary hazard, group 1 or 2 classification as defined by the plans. Provide coverage for all concealed combustible spaces including, but not limited to the attics and canopies.

System(s) will be supplied by an 6” underground dedicated fire sprinkler service located in Jan. 134.

The system(s) shall be complete with, but not limited to, sprinklers, piping, valves, alarm bell/horn, fire department connection, backflow preventer test connection, and controls necessary for a complete system.

See the plans for water supply flow test information.

1.2 CONTRACTOR QUALIFICATIONS:

The Contractor for the fire protection installation shall be a qualified Fire Protection Contractor licensed in the State of South Dakota that has been regularly engaged in the installation of similar Automatic Fire Sprinkler Systems and associated fire protection equipment for a minimum of 5 years.

1.3 AUTHORITIES AND AGENCIES:

All work will be installed for the approval and acceptance of the following:

Harrisburg Fire Marshal
Fire Protection Engineer

All material, equipment, valves, and devices installed or furnished under this Section shall be listed or approved for use in the fire protection installation by the authorities, agencies, codes and standards named in this Section of the Specifications:

Underwriters Laboratories - Approved Fire Protection (UL)
NFPA Pamphlet No. 13
NFPA Pamphlet No. 25

NFPA Pamphlet No. 72

1.4 DESIGN AND INSTALLATION STANDARDS:

The Fire Protection System shall be designed and installed to comply with the following standards and/or codes of the latest issue:

NFPA Pamphlet No. 13
Harrisburg Fire Rescue Policy Bulletins
Harrisburg Building Code

1.5 WORKING DRAWINGS:

Before commencing with the sprinkler installation, the Contractor shall submit Working Drawings to the authorities having jurisdiction and agencies specified for review and approval and/or acceptance. Following approval by authorities and agencies having jurisdiction, the Contractor shall submit the Drawings to the Architect/Engineer in accordance with the General Conditions and Section 210100, GENERAL PROVISIONS - SHOP DRAWINGS.

1.6 INSPECTION AND TESTS:

All inspections, examinations and tests required by the authorities and agencies specified shall be arranged and paid for by the Contractor as necessary, to obtain complete and final acceptance of the Fire Protection System.

1.7 CONTRACTOR'S CERTIFICATE:

After completion of the fire protection installation and at the start of the guarantee year, the Contractor shall execute and file five (5) copies of the "Contractor's Material and Test Certificate, Sprinkler systems - Water Spray Systems" with the Architect. At the time of final inspection the following maintenance shall be performed:

Operation of all control valves
Lubrication of operation stems of all interior control valves
Operation of alarm bell/horn
Cleaning of valves
Lubrication of fire protection inlet water connections

1.8 PIPE AND PIPE FITTINGS:

Refer to the requirements of Section 210100 - General Provisions, subsection Pipe and Pipe Fittings.

All piping installed in exposed locations shall be designated as such in the Shop Drawing submittals.

1.9 SPRINKLERS:

Except where designated otherwise on the drawings, sprinkler heads shall be as follows:

Sprinkler heads shall be standard semi-recessed white-plated pendant type in all locations where piping is concealed above ceilings.

Sprinkler heads shall be standard upright type where piping is installed exposed in storage, garage and other locations as indicated on the Drawings. Upright heads shall be plain brass finish.

Sidewall sprinkler heads, where permitted, shall be white-plated in finished rooms, plain brass elsewhere.

Concealed flush white-plated sprinkler heads shall be installed where noted on the Drawings.

Temperature rating of sprinklers shall be in accordance with requirements of approving authorities and as noted on the Drawings and per the requirements of NFPA 13.

Sprinkler heads shall be installed centered in the ceiling tile where applicable. Three locations are acceptable in 2 foot by 4 foot ceiling tiles.

Sprinkler heads shall be installed in areas where damage may occur, such as gymnasiums, shall have head guards and as otherwise designated on the drawings. Sprinkler heads installed at elevations below 7'-0" shall have head guards.

Sprinklers shall be Tyco, Reliable, Victaulic, Viking, or equal.

1.10 ESCUTCHEONS:

Escutcheons shall be installed as designated on the drawings and shall be the same make as the sprinkler that is used.

Escutcheons shall be Tyco, Reliable, Victaulic, Viking, or equal.

1.11 WATER FLOW SWITCHES AND ALARMS:

Flow switches for alarm bell/horn shall be furnished and installed by this Contractor. The exterior sprinkler alarm bell/horn shall be furnished, installed, and wired by DIVISION 26.

All required wiring not shown in DIVISION 26 shall be installed by this Contractor.

The Contractor shall also furnish and install the required tamper switches and zone flow switches to be wired to the fire alarm system by DIVISION 26.

Flow and tamper switches shall be Potter.

1.12 DRAINS:

Drains shall be located and piped to discharge to the locations designated on the plans. Where required drains are not noted on the plans system drains shall be piped to a floor drain or mop sink where said drains or sinks are capable of accepting full system flow without excessive deflection of discharging water. Drain shall be piped through the wall of the building to atmosphere when a floor drain or mop sink is not available and where piping through the wall of the building to atmosphere is most convenient and has been approved by the Architect/Engineer.

1.13 EXTERNAL BACKFLOW PREVENTER TEST CONNECTION:

Furnish and install a Guardian Series 6500 or equal flush outlet connection where shown on the Drawings. Wall plate shall read "BACKFLOW PREVENTER TEST CONNECTION." Finish shall be rough brass. Outlets shall be 2-1/2 inch size and inlet shall be 4 inch size. Install an automatic ball drip between the connection and the control valve.

Connections shall have rough brass plugs and chains. Outlets shall be 36 inches above finished grade or as specified on the drawings. Threads for Fire Department connections shall be National Standard. Verify threads and plug type with the local Fire Department.

External backflow preventer test connection shall be Guardian, Potter Roemer, Central, Elkhart, or equal.

1.14 FIRE DEPARTMENT CONNECTION:

Furnish and install a Guardian Series 6000 or equal flush connection where shown on the Drawings. Wall plate shall read "AUTOMATIC SPRINKLER." Finish shall be rough brass. Inlets shall be 2-1/2 inch size and outlet shall be 4 inch size. Install an automatic ball drips between the connection and the check valve.

Connections shall have rough brass plugs and chains. Locking Fire Department connection plugs shall be provided where required by the fire code official and where the responding fire department carries appropriate key wrenches for removal. Outlets shall be 36 inches above finished grade. Threads for Fire Department connections shall be National Standard. Verify threads and plug type with the local Fire Department.

External backflow preventer test connection shall be Guardian, Potter Roemer, Central, Elkhart, or equal.

1.15 DOUBLE CHECK VALVE BACKFLOW PREVENTER:

Furnish and install an Ames Fire & Waterworks Colt Series C200 or equal double check backflow preventer where shown on the Drawings. The backflow preventer shall be a complete assembly including tight closing shut-off valves before and after the device and also be protected by a strainer. Where required by the local authority having jurisdiction a pressure gauge shall be installed both before and after the double check backflow assembly. It shall be a complete assembly including four ball type test cocks.

The device shall meet the requirements of A.S.S.E. standard 1015 and A.W.W.A. standard C506.

Double check valve backflow preventer shall be Ames, Watts, Hersey, Conbraco, Febco, Wilkins or equal.

1.16 RISER MANIFOLD:

A riser manifold shall be provided for each wet zone designated on the drawings. The manifold shall include a 300 psi water gauge, water flow alarm switch with paddle, Schedule 40 pipe body, ductile iron angle valve with site glass, and pressure relief valve.

Riser manifold shall be Tyco, Viking, Reliable, or equal.

1.17 AUTOMATIC AIR VENT:

Furnish and install an automatic air vent for each wet zone. Automatic air vent shall be located near a high point in the wet system that allows for the maximum amount of air removal from that system. Automatic air vent shall have a minimum connection size of ½“and a minimum pressure rating of 175 psi.

The device shall meet the requirements of UL 2573.

Automatic air vent shall be Tyco, Viking, Reliable, or equal.

1.18 NITROGEN GENERATION SYSTEM:

Furnish and install a South-Tek Systems Nitrogen Generation Corrosions Inhibiting System or equal.

The Fire Sprinkler Contractor shall provide a complete system package that includes the following:

Nitrogen generator
Feed air compressor
Refrigerated air dryer
Pre-treatment air filtration package
Leak detection system
Air bypass tamper alarm
Purging devices
Supervisory gas monitoring devices
Nitrogen storage tank
Air maintenance device

The nitrogen storage tank and air compressor shall be connected by the Fire Sprinkler Contractor using 1/2 inch copper, galvanized, black steel pipe or approved flex housing rated at 175 psi. If components are connected further than 100 feet from each other or from the dry valve, 1 inch piping is required.

1.19 DRY PIPE VALVE:

Dry pipe valve shall by Tyco model DPV-1 or equal.

Maximum service pressure shall not exceed 250 psi.

Provide a package of trim including at a minimum the following items: water supply pressure gauge, system air pressure gauge, air supply connections, main drain valve, low body drain valve, alarm test valve, automatic drain valve, and drip funnel.

Dry pipe valve shall be Tyco, Victaulic, or equal

END OF SECTION 210500

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DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING

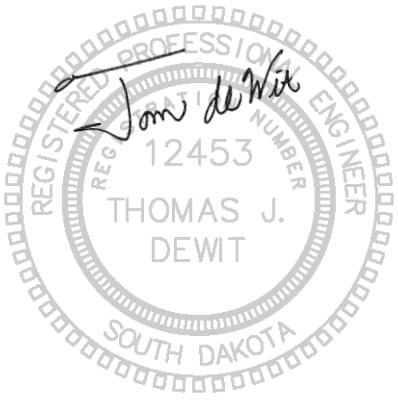
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PROJECT: HARRISBURG CITY HALL
HARRISBURG, SOUTH DAKOTA

ACEI PROJECT NO.: 126029

DATE: November 12, 2026

Project Manual sections prepared by or under the supervision of Thomas deWit, Reg. No. 12453, include all sections of Division 22-23.



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DIVISION 22 – PLUMBING AND HEATING

SECTION 220100 - GENERAL PROVISIONS

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

This Section pertains to general provisions and requirements for construction of work specified in all sections of Division 22 herein.

"Contractor" referred to in this Section of the specification implies the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the mechanical installation specified in Division 22 and/or as shown on the Contract Drawings.

Where the specifications in subsequent Sections of Division 22 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring and incidentals necessary to be installed in accordance with manufacturer's recommendations except as otherwise approved.

1.02 PERMITS AND SERVICE CHARGES:

All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

All work shall be executed in accordance with all local, state and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.03 CODES AND STANDARDS:

All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.

1. Local and State Codes, Standards and Regulations.
2. National Fire Protection Association (NFPA).
3. National Electric Code (NEC).
4. Underwriter's Laboratory (UL).
5. American Gas Association (AGA) Standards.
6. Uniform Plumbing Code.
7. International Mechanical Code.
8. ASME Boiler and Pressure Vessel Codes.
9. State Boiler Safety Code.
10. American Waterworks Association (AWWA).

11. National Sanitation Foundation (NSF).
12. Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).
13. International Building Code.
14. Life Safety Code.
15. State Energy Conservation Standards.
16. Americans with Disabilities Act (ADA).

All materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.04 COMPLIANCE:

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.05 DRAWINGS:

In general, the Drawings of the mechanical systems and equipment are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

Drawings of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

The Contractor, Subcontractor's and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others.

Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS:

The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least ten days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

1.07 SHOP DRAWINGS:

Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors.

To the extent practical, complete sets of shop drawings for each specification section shall be submitted. In the case that a particular item is required to be expedited, that particular item may be submitted individually.

Submit shop drawings in PDF format.

Furnish Shop Drawings as follows:

1. For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.
2. For all equipment, systems or devices where Shop Drawings are specifically called for.
3. For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.

The Contractor shall check all Shop Drawing submittals for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so

note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.

Shop Drawings will be reviewed by the Architect/Engineer, and copies of Shop Drawings will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.

Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages as may be incurred to the structure as a result of the above correction shall be paid by this Contractor.

Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.

1.08 CLEANING:

The Contractor and/or Subcontractors for the various phases of the work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished under any or all contracts in a clean first class condition.

Permanent heating and ventilating systems shall not be used during the construction period unless the project site is in a clean and dust free condition and shall be subject to the approval of the Architect/Engineer and Owner.

Surfaces of all coils, heaters, boilers, pumps and mechanical equipment shall be wiped clean or washed if required, leaving the installation in a first class condition. All throwaway filters used during construction shall be replaced.

All plumbing fixtures shall be thoroughly cleaned of all plaster, stickers, rust stains, and other foreign matter or discoloration, leaving every part in a first class condition and ready for use. The surfaces of all floor drains, cleanouts and other equipment shall be cleaned, and each item shall be left in a first class condition.

1.09 PAINTING:

Painting of materials and equipment furnished under the mechanical portion of the contract shall be as described in Division 9 - FINISHES. Contractor shall refinish and restore to the original condition and appearance, all mechanical equipment which has sustained damage to the manufacturer's prime and finish coats of enamel or paint. Materials and workmanship shall be equal to the requirements described in Division 9 - FINISHES.

1.10 RECORD DRAWINGS:

The Contractor shall keep a complete set of all mechanical drawings in the jobsite office for purpose of showing the installation of mechanical systems and equipment. This set of drawings shall be used for no other purpose. Where any materials equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall

be clearly and neatly shown on this set of drawings using ink or indelible pencil. At the completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property.

1.11 STERILIZATION OF WATER SUPPLY SYSTEM:

All domestic water and site irrigation systems (as applicable) shall be sterilized with sufficient chlorine to provide a dosage of not less than 200 ppm with a contact period of not less than 3 hours, and with all valves in line opened and closed at least three times during the sterilized period. Following the contact period, the water is to be thoroughly flushed from the system until the residual chlorine content is not more than 0.20 ppm.

A certificate of completion shall be provided.

1.12 OPERATING INSTRUCTIONS:

The Contractor shall furnish the Owner two (2) sets of complete catalog data, manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division. All such literature shall be bound in an amply sized three-ring binder and submitted to the Architect/Engineer for approval and for eventual transmittal to the Owner. The manual shall have a Table of Contents at the front of the manual. Before producing hard copies of the manuals, verify with the General Contractor if electronic or hard copy versions of the manuals are to be submitted.

The Contractor shall also supervise the initial operation of all equipment and instruct the operator selected by the Owner in such operation as required to acquaint him thoroughly with the equipment.

1.13 DELIVERY AND STORAGE OF MATERIALS:

Make provisions for delivery and safe storage of materials on the jobsite and make arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered at such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected. All stored equipment shall be protected from the weather conditions and construction debris with a protective covering securely tied in place.

1.14 MECHANICAL PROVISIONS:

Mechanical equipment shall operate without objectionable noise or vibration, as determined by the Architect/Engineer. If such noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, or other parts of the mechanical work, make necessary changes and additions, as approved, without extra cost to Owner.

Provide oil level gauges, grease cups and grease gun fittings for machinery bearings as recommended by the manufacturer. Extend oil or grease fittings by copper tubing to readily accessible locations.

1.15 CONCRETE BASES:

Concrete bases are required for floor mounted mechanical equipment inside buildings and are specified in Division 3 - CONCRETE. After bases are poured they shall set at least seven (7) days before mounting equipment. The Contractor shall coordinate the setting of expansion bolts in the bases for attachment of equipment and/or isolators.

This Contractor shall verify and coordinate the exact location of the bases and the exact size requirements for specific items of equipment.

As applicable, water heaters, water softeners, air compressors, vacuum pumps, boilers, pumps, tanks, indoor chillers and condensers and other floor mounted mechanical equipment shall be mounted on four inch (or as required) high concrete bases.

1.16 COORDINATION OF WORK:

The Contractor shall process shop drawings and order equipment and materials expeditiously after receiving the Contract and the mechanical installation shall be substantially complete when the general construction work is completed. This Contractor shall confer and cooperate with all other Contractors on this project and shall arrange his work in proper relation to the work of others. Each Contractor shall furnish, install, and maintain in place all anchors, inserts, sleeves, etc., required for his work. Each Contractor will also be held solely responsible for proper size and location of all anchors, inserts, sleeves, chases, recesses, openings, bases, etc., required for proper installation of his work. All cutting and patching made necessary by failure or neglect to coordinate with other Contractors shall be the responsibility of this Contractor. Any cutting or patching shall be subject to the direction and approval of the Architect/Engineer and all damage due to cutting or patching shall be repaired by this Contractor.

After being instructed by this Contractor to do so, the General Contractor will leave all openings in roof, walls, floors, etc., for the passage of pipes, etc. The General Contractor shall also provide concrete bases and roof curbs where shown for mounting the mechanical equipment unless specified otherwise. This Contractor shall verify the exact size and location required for installation of his equipment with the General Contractor.

In general, the Division 26 – Electrical Contractor will provide all power wiring and make one power connection to each item of mechanical equipment, as outlined under Electrical Section.

1.17 GUARANTEE:

Refer to the requirements of the General Conditions of the Contract for Construction (AIA Document A201), Section 3.5.

All mechanical equipment including equipment used during construction for temporary purposes shall be guaranteed for a period of one year after the time of final acceptance of this work and shall be in like new condition at time of final acceptance.

1.18 TEMPORARY HEATING AND COOLING:

The building heating and cooling systems shall not be used for temporary heating or cooling purposes without written approval of the Architect/Engineer.

Use of the building permanent heating and cooling systems prior to substantial completion is subject to the written approval of the Architect/Engineer and extended warranties shall be provided at no additional cost.

Typically, spaces must be completely free from significant dust and dusty construction procedures before approval to utilize the permanent systems will be granted. The Contractor shall provide for temporary heating, ventilating, air conditioning, or dehumidifying systems as needed.

1.19 ELECTRICAL:

Electric Motors:

All electric motor driven equipment being furnished and installed under Division 22 of these specifications shall be complete with electric motors, unless specified otherwise.

All electric motors shall be as manufactured by Westinghouse, Century, Wagner, Allis Chalmers, Reliance, General Electric, or equal. Bearings shall be ball type with alemite lubricating fittings extended to an easily accessible location for field servicing. Minimum service factors for all motors shall be 1.15. All motors shall conform to applicable NEMA standards and all motors specified for use in hazardous locations shall bear the stamp of approval of the Underwriter's Laboratories. All motors, except direct connected motors, shall be furnished complete with cast iron or stamped steel adjustable slide rails. Single phase motors shall be capacitor start type, drip proof, unless specified otherwise. All motors shall be single speed and shall operate at 1,750 RPM, unless specified otherwise.

Horsepower Rating: All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 120 percent of the driven unit brake horsepower requirements.

Single Phase Motors: Unless specifically noted otherwise, all electric motors shall be designed for operation in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current. Motors shall be thermally protected.

Three Phase Motors: All electric motors shall be designed for operating in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current.

All motors less than 3/4 horsepower shall be 115 volt, single phase unless designated otherwise and all motors 3/4 horsepower and larger shall be as specified in the specific section or as noted on the Drawings.

Premium Efficiency Motors:

Premium efficiency motors shall be furnished on all mechanical equipment where 1 horsepower or larger motors are required.

Motors shall be designed with special stator steel for reduced core losses. Windings shall be oversized copper placed for maximum efficiency. Stator and rotor shall be extra long to reduce

flux losses. Frame shall be ODP (unless specified otherwise) of cast iron or cast aluminum construction.

Motors shall be squirrel cage, horizontal base mount, ball bearing, NEMA B design, Class B design, Class B insulation, continuous duty, 1.15 SF, 40 degrees C. ambient.

Minimum nominal full load motor efficiencies shall be based on ASHRAE Standard 90 (latest edition).

Furnish and install Aegis SGR, or equal, maintenance free, circumferential, conductive micro fiber shaft grounding rings on all AC motors controlled by adjustable frequency drives to discharge shaft currents to ground.

Motors shall be similar to Louis Allis "Spartan" Series, Gould "E-Plus" Series, or Westinghouse "MAC II" Series. Manufacturer shall furnish proof of efficiency rating.

Motor Starters:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 22 of these specifications, all motor starters will be furnished and installed under Division 26, ELECTRICAL.

Electrical Wiring:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 22, all electric power wiring shall be furnished and installed in Division 26, ELECTRICAL. The Electrical Contractor will make one power connection to each item of mechanical equipment, unless specified otherwise.

Electrical wiring furnished and installed under these specifications shall conform to all applicable requirements of Division 26, ELECTRICAL.

Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in accordance with the following schedule:

Item	Division Furnished Under	Set in Place or Mounted Under	Division Wired & Connected Under
Equipment Motors	22	22	26
Magnetic Motor Starters:			
Automatically controlled, with or without HOA switches	26	26	26
Automatically con-			

trolled, with or without HOA switches and furnished as part of factory wired equipment	22	22	26
Manually controlled	26	26	26
Manually controlled and furnished as part of factory wired equipment	22	22	26
Line voltage thermostats, time clocks, etc., not connected to control panel systems	22	26	26
Electric thermostats, time clocks, remote bulb thermostats, motor valves, float controls, etc., which are an integral part or directly attached to ducts, pipes, etc.	22	22	22
Temperature control panels and time switches mounted on temperature control panels	22	22	22
Motor valves, solenoid valves, EP and PE switches, etc.	22	22	22
Alarm bells	22	22	22
Control circuit feeders	26	26	26
Low voltage controls, thermostats, valves, etc.	22	22	22
Fire protection controls	22	22	26

Fire and smoke Detectors	26	26	26[(1)]
Pushbutton stations, pilot lights	26	26	26
Heat tape	26	26	26
Disconnect switches, thermal overload switches, manual operating switches	26	26	26
Multi-speed switches	22	26	26
Contactors	26	26	26
Control relays, transformers	22	26	26

NOTES:

(1) Wiring from alarm contacts to alarm system shall be by the Division 26 Contractor; control function wiring shall be by the Division 22 Contractor.

All control wiring and controls as noted on the Drawings and/or as specified in these specifications shall be provided by this Contractor, including items set in place and wired and connected by the Division 26 Contractor, unless specifically shown otherwise on the Drawings.

1.20 SLEEVES:

Any pipe passing through building construction including walls, floors, roofs or masonry partitions or as noted on the Drawings shall be encompassed with sleeves in accordance with the following:

All pipe sleeves through slabs, floors, masonry walls and masonry partitions shall be 1/2 inch greater in inside diameter than the external diameter of pipe passing through. Sleeves for insulated piping shall be large enough to accommodate the insulation without harming the insulation or vapor barrier. All sleeves shall be fabricated from new material cut square and reamed.

Sleeves shall be provided in all masonry partition walls including locations above suspended ceilings where masonry partition walls extend from floor slab to slab above. Sleeves shall be Schedule 40 steel pipe finishing flush with the wall surface.

Sleeves through exterior building walls shall be Schedule 40 steel pipe with welded flange in the middle of the sleeve and ends finishing flush with finished surfaces. Space between pipe and sleeve shall be packed to provide a watertight joint.

Sleeves through roof slabs and floor slabs in concealed locations shall be No. 22 gauge galvanized steel or crete sleeves (linear polyethylene). Concealed sleeves shall be considered as pipe sleeves in shafts, pipe chases and within walls and partitions.

Sleeves through floor slabs in exposed areas shall be Schedule 40 steel pipe and sleeves shall extend 1/4 inch above the finished floor surface. For slabs in equipment rooms and in other wet areas, sleeves shall be Schedule 40 steel pipe and shall extend 2 inches above finished floor surface.

Floor sleeves in membraned floors shall be furnished with flashing rings and clamps.

All sleeves in exposed locations, except equipment rooms, shall be set so plates specified will cover the sleeves.

All pipe sleeves where wet conditions exist, except sleeves through exterior walls, shall be caulked with a plastic caulking, including sleeves in concealed locations. The space between the pipe and the sleeves shall be packed with oakum and approximately 1/2 inch depth of a polyisobutylene
sealer shall be packed or caulked in both ends of sleeve, even with the ends of the sleeve. The sealer shall be suitable for temperatures from minus 50 degrees to 300 degrees, suitable for painting, non-corrosive and have good adhesion.

Sleeves in fire rated construction, equipment rooms, and/or where designated on the Drawings shall consist of 22 gauge galvanized sheet steel with lock seam joints. Seal sleeves with a fire retardant sealant. When applied according to manufacturer's recommendations, sealant shall have a 3-hour U.L. fire rating.

All sleeves required to provide the proper openings in masonry construction for the passage of ductwork, mechanical equipment, etc., shall be furnished and installed by this Contractor. These sleeves shall also be removed by this Contractor after the opening has been formed. The opening around all ductwork, equipment, etc., passing through slabs, floors, walls and partitions shall be sealed as specified above for piping. Fire/smoke dampers shall be installed in accordance with the manufacturer’s installation instructions.

All sleeves shall be set and maintained in place by this Contractor during the progress of the work. This Contractor shall be responsible for locating all sleeves at the proper location.

Sleeves are not required for core drilled masonry wall and floor holes, masonry wall and floor holes formed by polyethylene plastic (removable) sleeves, or for masonry holes made in another neat manner except in equipment rooms and other wet areas.

Sleeves are not required in metal or wood stud wall construction. Rated systems shall be provided as required to provide the necessary rating of the penetration.

Interior wall sleeves are only required on cold insulated piping (cold water, downspout, chilled water supply and return, etc.). All other steel or cast iron piping 4 inches and smaller shall be grouted directly into the wall as necessary to provide the required fire and smoke rating. Piping larger than 4 inch size and all non-rated piping shall be provided with a rated system.

Firestopping materials shall be 3M, Hilti, MetaCaulk, Nelson or equal.

1.21 WALL, FLOOR AND CEILING PLATES:

Furnish and install chrome-plated wall, floor and ceiling plates on all exposed pipes where they pass through walls, floors, or ceilings in finished areas. Finished areas shall be those areas which are painted or have special finishes within the room. The wall plates shall be a minimum of 3/32 inch thickness and shall have set screws or spring locks for clamping to the piping. Specified flush valves shall have set screw type wall plates. The plates shall be chrome-plated steel, cast iron or brass and shall set tight against the wall.

1.22 EQUIPMENT SUPPORT:

Furnish and install all necessary wall backing, brackets, braces, plates, angles, closet carriers, lavatory carriers, urinal carriers, wall hangers, etc., required for properly supporting plumbing fixtures, mechanical equipment and mechanical appurtenances. All supports shall be securely anchored with lead inserts, expansion shields, through-going bolts, lag screws or other devices as required.

All items of mechanical equipment hung from overhead structure shall be hung from 2-1/2 inches by 2-1/2 inches by 3/16 inch angles minimum which shall span at least 3 members, unless noted otherwise.

1.23 EXISTING SERVICES:

The Contractor shall verify the exact location of all existing building services extended and/or relocated for this project. The Contractor shall also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

All active services which are encountered shall be protected, braced and supported where required for proper execution of the work and without interruption of the service if possible.

All inactive services which are encountered shall be protected or removed as directed by the Architect/Engineer, Owner, Utility Company or Municipal Agency having jurisdiction. The service shall also be plugged or capped as directed.

When active services must be temporarily interrupted, the interruption shall be scheduled at night or at such time as approved by the Owner or authority having jurisdiction and so as to cause the minimum of interference with establishing operating routine. Arrangements shall be made to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

1.24 EXCAVATION:

Trenching and excavation for all underground piping and equipment shall be excavated to the required depths. The bottom of the excavation shall be tamped hard and graded to secure the required fill. Bell holes shall be excavated so that pipe will rest on solid ground for its entire length. Rock, where encountered, shall be excavated to a depth of 6 inches below the bottom of pipe and before pipe is laid, the space between bottom of pipe and rock surface shall be filled with gravel. Sewer and water pipes shall be laid in separate trenches, except where otherwise noted and in accordance with applicable codes.

After the piping and equipment have been tested, inspected and approved by the Architect/Engineer and prior to the backfilling, forms shall be removed and the excavation shall be cleaned of trash and debris. Materials for backfilling shall consist of the excavation, or borrow of sand or gravel, and shall be free of trash, lumber, or other debris. Backfill shall be placed in horizontal layers, not exceeding 9 inches in thickness, and properly moistened. Backfill inside the building and under any exterior slabs or other paved areas shall be compacted by hand or mechanical means to the density of 95 percent Proctor and areas outside the building not covered by concrete slabs or other structures or pavement shall be compacted to the density of the adjacent undisturbed soil. Any settling within the one (1) year guarantee period shall be repaired at no cost to the Owner.

1.25 ACCESS TO EQUIPMENT:

Access shall be provided to all motors, valves, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The location of the access openings relative to the mechanical equipment shall be coordinated to assure proper access to the equipment. The door shall maintain any ratings of the wall, ceiling, etc. that it penetrates.

Access openings are required for valves and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, walls, ceilings, etc., under this portion of the Contract.

1.26 PROTECTIVE DEVICES:

All sheaves, belts, drives, couplings, and moving parts shall be protected by approved permanent guards, shields, or railings, which shall be in place whenever the equipment is in operation and shall be in accordance with applicable safety standards.

All pressure and/or temperature relief valves shall have the discharge piped full size to within 6 inches of the floor or floor drain. The piping shall be securely anchored. All relief valves shall be ASME approved and proper size for the application.

1.27 PIPE AND PIPE FITTINGS:

Furnish and install where shown on the Drawings and required to connect fixtures and equipment, pipe and fittings of type and material for the various services as noted below. At all exposed fixture supply connections, nipples are required between copper tubing and fixtures, such nipples shall be standard weight full iron pipe size chrome-plated brass pipe nipples with suitable brass or copper adapters. Steel or iron nipples will not be permitted in any location in copper lines where connections are made to brass fixtures, valves or trim. Compression stops may be used when fitted tight against the wall escutcheon with no exposed copper piping. Sweat adapters and chrome plated cover tubes may be used when the cover tube extends the entire pipe from the elbow in the wall or chase to the flush valve and fits tight.

Piping that is not shown on the Drawings, which is obviously necessary for complete systems, shall be provided and shall be amply sized in accordance with applicable codes and standards.

All welding fittings shall be Tube Turn, Taylor Forge, B & W, Ladish Yoloy, or equal.

The Contractor may use a mechanically formed tee fitting as manufactured by T-Drill or equal. All joints created in this manner shall be installed and brazed in compliance with Plumbing Codes

and the manufacturer's recommendation. Soft soldered joints are not allowed in mechanically formed tee fitting installations. The branch tube shall be notched and contain a double dimple. The first to insure proper penetration into the main line. The second dimple (1/4" above the first) will serve as a visual inspection point.

Grooved pipe fittings, valves and couplings shall be Victaulic, Anvil Gruvlok, Central Sprink, Star or equal. All components shall be supplied by one manufacturer.

Underground steel piping systems shall be coated with asphaltum or bituminous paper for corrosion protection.

Plastic piping shall not be used in air plenums or in buildings classified as noncombustible construction.

The piping for the various systems shall be as follows:

Cold, hot and recirculating hot water in buildings above ground, 4 inches and smaller shall be Type L, hard drawn copper tubing, ASTM B88 and Federal Specification WW-T-799. Fittings shall be wrought copper solder type, ANSI B16.22. Joints for pipe and fittings shall be made with No. 95-5 (tin-antimony) solder and No. 50 non-corrosive flux. Pro-Press, or equal copper pipe fitting system may be used.

Soil, waste, rainwater and vent piping in buildings underground shall be cast iron, ABS or PVC plastic.

Piping may be service weight cast iron soil pipe, Federal Specification WW-P-401 hub and spigot to 5 feet outside building walls, coated with asphaltum. Fittings shall be cast iron hub and spigot, coated with asphaltum. Piping may be hubless cast iron pipe and fittings.

Where codes permit, piping may be ABS or PVC Schedule 40 plastic piping and fittings. ABS piping and fittings shall meet ASTM D2661-68. PVC piping and fittings shall meet ASTM D2665-68 and Federal Specification L-P-320.

Soil, waste, rainwater and vent piping in building, above ground shall be cast iron, ABS or PVC plastic as follows:

Piping may be standard weight screwed, or hubless cast iron pipe and fittings. If screwed cast iron is used, threads shall be painted after assembly.

Where codes permit, piping may be ABS or PVC Schedule 40 plastic piping and fittings. ABS piping and fittings shall meet ASTM D2661-68. PVC piping and fittings shall meet ASTM D2665-68 and Federal Specification L-P-320.

For 2 inch and larger pipe, piping may be standard weight, cast iron, hub and spigot soil pipe, Federal Specification WW-P-401. For 1-1/2 inch and smaller pipe, Schedule 40, galvanized steel, ASTM A120 and Federal Specification WW-P-406. Fittings for hub and spigot shall be long pattern. For 1-1/2 inch and smaller fittings shall be black cast iron, screwed, drainage fittings (Durham) long

pattern. Hub and spigot joints shall be preformed molded rubber rings where codes permit.

Soil, waste, and rainwater piping outside of building shall be ABS or PVC plastic or cast iron pipe (CIP) as follows:

Cast iron pipe shall be service weight soil pipe Federal Specification WW-P-401, coated.

Where codes permit, piping may be ABS or PVC Schedule 40 plastic piping and fittings. ABS piping and fittings shall meet ASTM D2661-68. PVC piping and fittings shall meet ASTM D2665-68 and Federal Specification L-P-320.

Where codes permit, piping may be ABS or PVC type SDR 35 plastic piping and fittings. Piping and fittings shall meet ASTM 3033 and 3034.

Cooling coil condensate drains and louver drains in buildings above ground shall be PVC or Copper, as follows:

Schedule 40 PVC piping and fittings shall meet ASTM D2665-68 and Federal Specification L-P-320.

Type L, hard drawn copper tubing, ASTM B88 and Federal Specification WW-T-799. Fittings shall be wrought copper solder type, ANSI B16.22. Joints for pipe and fittings shall be made with No. 95-5 (tin-antimony) solder and No. 50 non-corrosive flux. Pro-Press, or equal copper pipe fitting system may be used.

Hot water heating supply and return shall be Schedule 40 black steel or copper pipe as follows:

Schedule 40 black steel pipe shall conform to ASTM A120/ASTM A53 and Federal Specification WW-P-406, Weight A. Sizes 2 inch and smaller shall have screwed ends. Sizes 2-1/2 inch and larger shall have plain ends for welding. Fittings shall be 125 pound screwed, banded, black cast iron for sizes 2 inch and below, and standard weight welding fittings (use long radius ells) for sizes 2-1/2 inch and larger. Welding flanges shall be used adjacent to equipment and valves. Welding rods as recommended by ASTM Specification A233. Welding rings shall be used at all joints.

Mega-press Schedule 40 black steel fittings, or equal may be used for 2” and smaller sizes.

The Contractor may use grooved steel pipe, grooved fittings and mechanical couplings as manufactured by Victaulic, Grinnell, Anvil Gruvlok or equal on all systems recommended by the manufacturer. Grooved piping systems including valves, fittings, etc., shall be supplied by only one manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components. Grooved fittings shall be ASTM A536 ductile iron or ASTM A53 forged or fabricated carbon steel with grooved ends designed to accept grooved joint couplings of the same manufacturer. Coupling gaskets shall be Grade EPDM suitable for hot water systems up to 250 deg F. Rigid style coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity.

Flexible style couplings shall be installed where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connection, shall be placed in close proximity to the source of the vibration.

Copper piping shall be hard drawn Type L copper tubing, ASTM B88 and Federal Specification WW-T-799. Fittings shall be wrought copper solder type, ANSI B16.22. Joints for pipe and fittings shall be made with No. 95-5 (tin-antimony) solder and No. 50 non-corrosive flux. Pro-Press, or equal copper pipe fitting system may be used.

The Contractor may use roll grooved copper tubing, grooved fittings and mechanical couplings as manufactured by Victaulic, or equal, on all systems recommended by the manufacturer. Grooved piping systems including valves, fittings, etc., shall be supplied by only one manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze casting with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted). Housings shall be cast with offsetting, angle pattern bolt pads coated with copper-colored enamel. Gasket shall be Grade EPDM suitable for hot water systems up to 250 deg F.

The grooved coupling manufacturer's factory-trained field representative (direct employee) shall provide on-site training to the Contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. The factory-trained representative shall periodically review product installation. The Contractor shall remove and replace any improperly installed products.

Underground cold, hot, and recirculating domestic systems and heating water supply and return shall be as follows:

Provide a pre-insulated piping system of a flexible design. All components of carrier pipe, insulation, and jacket must be able to expand and contract as a unit without overstressing or adversely affecting any of the materials. The pipe, insulation, and jacket will all be made of materials that will not corrode. The insulation shall completely fill the annular space between the service pipe and jacket and shall be completely bonded to both. The insulation must be polyurethane. Systems using open-cell insulation, polyethylene insulation, PEX insulation, or any non-bonded system, or partial-bonded system design shall not be allowed. The system will be designed to be installed in a manner that will not require expansion loops or compensators of any type. The system will be installed with the fewest number of underground joints possible. The piping system supplier will be responsible for the overall design of the expansion and contraction compensation. The system will be supplied complete with coupling fittings, insulation kits, and termination fittings all supplied by the piping system supplier. All products must be manufactured to ISO 9002 standards.

The carrier pipe shall be a Cross-linked PEX-A pipe with EVOH (oxygen barrier Engel Method). NSF 61 certified. ASTM F876 and F877 for all pipes 3/4" - 2". 204˚F maximum, 230˚F intermittent. Pex-B and Pex-C products not allowed.

All insulation materials will be supplied by the system manufacturer and will be polyurethane closed cell insulation with a K-Factor of .149. The insulation will be furnished with a nominal insulation of 1".

The outer protective jacket shall be corrugated seamless polyethylene completely encompassing and protecting the insulation from moisture and damage, designed for H-20 loading at a burial depth of 2 foot minimum.

All fittings and connections will be either brass, copper, steel or electro-fusion fittings. They will be installed in accordance with the detailed installation instructions. All buried fittings and couplings will be insulated and sealed per the system supplier's instruction. All fittings for potable to be ASTM Approved.

All direct buried ends of insulated pipe with exposed insulation will be sealed with watertight polyethylene end seals.

All carrier pipe systems should be hydrostatically tested at 1-1/2 times the operating pressure prior to burial or 100 psi.

A minimum of 4" of sand needs to surround the piping on all sides in the trench. Piping shall be suitable for H20 loading from 24" underground.

Natural gas piping shall be standard weight black mild steel pipe, ASTM A120/ ASTM A53 and Federal Specification WW-P-406. Fittings for exposed gas piping up to and including 2 inch size shall be standard weight black malleable iron screwed fittings. Fittings 2-1/2 inch size and larger and in all concealed locations shall be welding type. There shall be no unions installed in concealed locations. Mega-Press, or equal pipe fitting system may be used. All underground gas piping shall be a gas polyethylene piping system designed, tested and certified for direct burial. Provide risers to transition from below ground polyethylene pipe to above ground metallic pipe. Provide detectable marking tape and tracer wire to locate the line after burial. A manual shut-off valve, union, and pressure regulator shall be installed at each item of mechanical equipment with a gas connection. A manual shut-off valve shall be installed at all gas connections.

1.28 VALVES:

Furnish and install valves in piping where so indicated on the Drawings. In addition, shut-off valves shall be provided in piping adjacent to each item of equipment, fixtures, etc., in the branch piping to each toilet group and at the base of all water risers.

All cold water and chilled water valves shall have an extended operator stem and insulation sleeve to accommodate the pipe insulation and vapor barrier.

All gate and globe valves shall be installed with stem in a vertical position wherever possible.

Of the several manufacturers listed, the Contractor is to standardize on one make as much as practical but not to the extent of sacrificing quality listed. Valves shall be Milwaukee, Crane, Powell, Stockham, Walworth, Victaulic, Grinnell, Anvil Gruvlok, Watts, Nibco, Hammond or equal.

The valves designated in the following schedule are fully described in the valve list following this schedule.

Valve Service	Valve Designation
Shut-Off Valves For:	
Cold, Hot and Recirculating Hot Water	
Pipe sizes 2 in. and smaller	V-l or V-2
Pipe sizes 2-1/2 in. and larger	V-13
Natural Gas	
Pipe sizes 2 in. and smaller	V-9
Pipe sizes 2-1/2 in. and larger	V-11
Circulating Heating Water	
Pipe sizes 2 in. and smaller	V-1 or V-2
Pipe sizes 2-1/2 in. and larger	V-5 or V-13
Duct Mounted Heating Coils	V-1 or V-2
Unit Heaters, Convectors, Radiation	V-1 or V-2
Balancing Valves For:	
Recirculating Domestic Hot Water	V-l
Circulating Heating Water	
Pipe sizes 2 in. and smaller	V-1
Pipe sizes 2-1/2 in. and larger	V-13
Unit Heaters, Convectors, Radiation	V-1
Check Valves For:	
Cold, Hot and Recirculating Hot Water	
Pipe sizes 2 in. and smaller	V-4
Pipe sizes 2-1/2 in. and larger	V-8
Circulating Heating Water	
Pipe sizes 2 in. and smaller	V-4

Pipe sizes 2-1/2 in. and larger	V-8
Drain Valves	V-14

The following is a list of valves types from which valves for use on this project have been selected. See the valve service schedule preceding this list for types to be used on each service.

(V-1) Ball Valves (Fed. Spec. WW-V-35b,): Bronze body ball valve, conventional port, lever handle, screwed or soldered and teflon seats and stem packing, 150 psi SWP, 400 psi WOG, Milwaukee BA-100 or BA-150, 1/2 inch through 2 inch size. Provide Memory Stop on all valves used for balancing purposes.

(V-2) Gate Valves (Fed. Spec. WW-V-54c, Class A. Type II): Bronze body gate valve, rising stem, solid bronze wedge, screw-in bonnet, threaded or soldered ends, teflon packing, 125 psi SWP, 200 psi WOG, 1/4 inch through 2 inch size, Milwaukee 148 or 149.

(V-4) Bronze Check Valve (Fed. Spec. WW-V-5ld, Class A, Type IV): Bronze check valve, horizontal swing regrinding type, Y-pattern, renewable disc, 125 psi SWP, 200 psi WOG, 1/4 inch through 2 inch size, Milwaukee 509 or 1509.

(V-5) Iron Body Gate Valve (Fed. Spec. WW-V-58a, Class I, Type I): Iron body gate valve, bolted bonnet, outside screw and yoke, solid wedge, flanged bronze rising stem, bronze trim, 125 psi SWP, 200 psi WOG, 2-1/2 inch size and larger, Milwaukee F-2885.

(V-8) Iron Body Check Valve: Iron body swing check valve, bolted bonnet, horizontal swing renewable seat and discs, flanged, bronze trim, 125 psi SWP, 200 psi WOG, 2-1/2 inch size and larger, Milwaukee F-2974.

(V-9) Plug Cock: Bronze body square head cock, screwed, 150 psi 1/8 inch through 2 inch size, Lunkenheimer 454.

(V-11) Lubricated Plug Valve: Semi-steel body lubricated plug valve, wrench operated, 100 percent area, rectangular port, screwed or flanged, teflon stem seal, natural gas service, 125 psi SWP, 150 psi WOG, Homestead 602.

(V-13) Butterfly Valve: Wafer or lug type iron body butterfly valve, extended neck, stainless steel shaft, bronze disc, EPT seal and seal with 275 degrees F. temperature rating, lever operated up through 6 inch valve size and gear and crank operator over 6 inch valve size, 150 psi WOG, 2-1/2 inch size and larger Milwaukee "M" series.

(V-14) Drain Valve: Bronze body globe valve, screw-in bonnet, integral seat, renewable discs, 1/8 inch through 2 inch size, Milwaukee 502 or 1502.

1.29 PIPING CONNECTIONS:

Furnish and install unions or mating flanges at all connections to each piece of equipment, conveniently located to facilitate quick and easy disconnecting of equipment for replacement, tube cleaning or general maintenance. Flanged or union connections shall be used on both sides of equipment connections, steam traps, control valves, pressure reducing valves, meters, tanks, pumps and the like. Unions or flanges shall be of the same material or finish as the piping systems in which they are installed. Unions are not required for grooved pipe systems.

Dielectric unions, flanges, or waterways shall be installed in hydronic piping systems, domestic hot, cold and recirculating water lines where copper or brass piping is connected to ferrous material such as steel piping, steel tanks, steel water heater, etc. Dielectric unions 2 inch size and smaller shall be steel body and nut with insulating gasket and copper connector, 250 psi rating at 190 degrees F., EBCO Model FX, FB, or EA. For 2-1/2 inch size and larger, the union shall be flanges, cast iron with insulated gasket and copper connector, 175 psi rating at 190 degrees F., EBCO Model GX or GA.

Grooved pipe and mechanical joint couplings may be utilized in certain piping systems with Architect/Engineer approval. See section on pipe and pipe fittings.

1.30 FLEXIBLE CONNECTORS:

Furnish and install flexible connectors on all piping connections to rotating equipment such as pumps, compressors, chillers, condensing units, fluid coolers etc., and where shown on the Drawings. Flexible connectors shall also be installed at all locations where necessary to prevent damaging stresses to piping, equipment, or building structure, and where necessary to isolate noise at its source.

Flexible connectors for chillers, heating and cooling pumps, condensate pumps, cooling towers, fluid coolers, etc., shall be Kinetics noise control type FTC, or equal double sphere molded neoprene, reinforced with nylon tire cord and shall have mild steel floating flanges or threaded ends. The connectors shall be rated for 150 psig at 220 degrees F. Control rods shall be used on 12 inch and larger sizes operating above 100 psig. Flexible connectors may be close pitch annular corrugated stainless steel metal hose, Type 321 stainless steel for all ferrous piping systems, Kinetics BFMC, or equal.

Flexible connectors for all air compressors shall be close pitch annular corrugated stainless steel metal hose, Type 321 stainless steel for all ferrous piping systems, Kinetics BFMC, or equal.

Flexible connectors shall be installed in strict accordance with manufacturer's recommendations and shall be constructed of material specified herein, unless recommended otherwise by the manufacturer for specific applications. All piping shall be anchored to prevent elongation or compression of the flexible connectors.

Flexible connectors for installation outdoors (at chillers, fluid coolers, etc.) shall be rated for -25 deg. F or colder operating temperature.

Flexible Connectors shall be Kinetics, Metraflex, Proco, Mercer, Flexonics, Twin City Hose, Inc., Maxon Industries, or equal.

1.31 PIPE HANGERS, SUPPORTS AND ANCHORS:

Anchors as shown and detailed on the Drawings and specified herein and/or as required. All support components shall conform to Manufacturer's Standardization Society Specification SP-58. The hangers shall adequately support the piping system. They shall be located near or at changes in piping direction and at concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping. On other than vapor barrier insulated lines, hangers shall bear directly on piping.

Hangers shall be constructed of malleable or wrought iron unless noted otherwise, and hangers supporting copper pipe shall be copper plated. Hangers for pipe 3 inches and smaller shall be band and socket Michigan Model No. 100 or equal. For piping over 3 inches, hangers shall be adjustable, Clevis type, Michigan Model No. 400 or equal.

Where groups of three or more pipes occur, they may be supported with trapeze hangers using two hangers as specified with a capped pipe cross member.

Where clearance between pipe and overhead support is insufficient for the use of other hangers specified, use Michigan Model No. 605 or equal.

Provide piping Supports, guides, and allow for expansion for horizontal and vertical piping according to Uniform Plumbing Code (UPC) section 313.0 “Hangers and Supports” minimum requirements, the pipe manufacturer’s installation instructions, and the Authority Having Jurisdiction, whichever is more stringent.

Pipe hangers shall not be attached to the roof deck. Hangers shall be attached to the structure with beam clamps, beam attachment and brackets bolted to joists and beams. Use Michigan Model No. 340 or equal, steel washer plates for pipe supported from steel joist. The Contractor shall endeavor to hang near joist panel joints wherever possible.

Pipe hangers for cold piping, horizontal downspout piping and all insulated piping on trapeze hangers shall be large enough to encompass the insulation, using a metal shield so the vapor barrier jacket will not be broken. See Insulation Section.

Pipe mounting brackets for cold piping shall be large enough to encompass the insulation B-Line Model B2417 or equal. This piping shall be anchored securely at the point of connection to plumbing fixtures. The last mounting bracket adjacent to fixtures and equipment may clamp directly onto the pipe. A short length (18 inches maximum) of piping between the last bracket and the connection is allowed without insulation.

Hanging from one pipe to another is prohibited.

Pipe Hangers shall be Michigan, Grinnell, PHD, B-Line or equal.

1.32 PIPING INSTALLATION:

All pipes shall be round and straight, of required size. Cutting shall be done with proper tools and pipes shall be reamed to full size after cutting.

Piping shall be properly enclosed, supported, guided, anchored, sway braced, connected, tested, cleaned and flushed out and shall be properly insulated and protected where required.

All pipes shall be run with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of the Architect/Engineer. Lines required to be enclosed in ceiling, chaseways or similar spaces shall be installed to permit such enclosure as intended. All pipe runs shall be carefully laid out and scheduled to avoid necessary interferences with other work. Pipe sizes shown on the Drawings are nominal pipe sizes and not outside diameters.

Pipes shall be run substantially as indicated on the Drawings. However, the Architect/Engineer reserves the right to require this Contractor to make changes in pipe locations where conflicts occur with other trades. Such changes shall be made without extra cost to the Owner.

Piping shall be installed with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Such provision shall be made by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Suitable anchors and guides shall be provided to permit proper deflection and compression of offset loops and expansion joints. Expansion joints shall not be used in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the Drawings or where otherwise obviously necessary.

Exposed piping shall be installed in a sanitary manner for ease in cleaning. Pipe shall be cut and threaded to fit the installation. Wherever possible, rough-in exposed pipe connections at the wall rather than the floor for ease in cleaning.

Equipment piping shall also include wastes and drains which are safe-wasted without a direct connection.

Minimum grade for horizontal drainage piping shall be 1/4 inch per foot for 3 inch diameter piping or less, 1/8 inch per foot for 4 inch and 6 inch diameter piping and 1/16 inch per foot for drainage piping over 6 inch diameter.

1.33 WELDED PIPING SYSTEMS:

The following specification covers permissible assemblies for welded pipe lines for all services operating at 160 psig or less.

All welding shall be performed by certified welding operators and in accordance with procedures recommended in the latest revision of the Code for Pressure Piping ASA B31.1. No welding may be done prior to a welding certificate being submitted and accepted for the person or persons designated to do all the welding.

The use of mitered elbows in welded lines will not be permitted. Welding elbows shall be used for all bends.

Mitered tees will not be permitted in welded lines. Connections shall be made with welding tees. The use of weldolets will be permitted in lieu of welding tees in welded lines provided they are installed in prefabricated assemblies and the pipe interior is cleaned of slag. Field installation of weldolets will be permitted where the branch piping is one-half the size of the main piping or less.

Mitered reducers will not be permitted in welded lines. Reduction in lines shall be made with welding reducers.

Pipe caps in welded lines may be fabricated from flat steel plate cut round and inserted into the pipe a sufficient depth to permit a fillet weld equal to the plate thickness. The plate thickness shall be twice the pipe wall thickness for pipe sizes 12 inches or less.

The pipe ends in all tees, laterals and reducers shall be carefully prepared to provide for proper weld penetrations in accordance with ASA Standards. Long radius, reducing type, butt welding

elbows, in size 2-1/2 inch and larger, shall be used at pump and equipment connections wherever a change in pipe size and a 90 degree change in direction are involved.

Butt welding tees, forged steel socket welding tees or forged steel welding outlet fittings shall be used for making branch connections in welding piping systems.

Pipe ends and other pipe joints which are to be welded shall be carefully prepared to provide for proper weld penetration.

1.34 PRESSURE GAUGES:

Furnish and install U.S. Gauge Model 5105 or equal pressure gauges in pipelines and on equipment as indicated herein and/or where shown on the Drawings. Gauges shall have phosphor bronze bourdon tube with brass movement.

Gauges shall be compound, pressure or vacuum as required with 4-1/2 inch diameter dial. Each gauge shall be complete with Trerice No. 872 pressure snubbers, and brass ball valves. Gauges on steam and steam condensate lines shall also have a black iron siphon. Ball valves shall be provided on all gauges at the inlet and outlet of each and all heating and cooling circulating pumps, and chillers.

The normal operating pressure of each gauge shall be 50-70 percent of full scale. The range of the scale shall be suitable for the application.

The gauges shall be located and mounted such that they can be conveniently read by a person standing on the equipment room floor. Accuracy shall be Grade "A". Case shall be aluminum.

Pressure gauges shall be provided on each pump with shut off valves arranged to read both sides of the pump with a single gauge.

Pressure gauges shall be U.S. Gauge, Trerice, Weksler, Ashcroft, Weiss or equal.

1.35 THERMOMETERS:

Furnish and install Weiss "Thriftline" TL5S2 or TS5A2 or equal thermometers in pipelines and equipment as tabulated and/or where shown on the Drawings. Thermometers shall have a minimum of 6 inch scale with separable socket, cast aluminum case, red reading mercury, industrial type complete with thermometer wells.

The normal operating temperature of each thermometer shall be at 50-70 percent of full scale. The range of the scale shall be suitable for the application.

Thermometer installation will not be accepted unless they can be easily read by an operator standing on the floor.

Thermometers shall be provided at the inlet and outlet of each and all chillers, boilers, heat exchangers, storage tanks, and cooling tower supply and return piping. Thermometers shall also be required on the outlet of all domestic water heaters and mixing valves.

Thermometers shall be Weiss, Trerice, Weksler or equal.

1.36 PRESSURE/TEMPERATURE TEST PORTS:

Furnish and install where indicated on the Drawings or tabulated below pressure/temperature test ports. Port shall be solid brass with valve cores capable of receiving either temperature or pressure probe with 1/8 inch o.d. Cores shall be Neoprene when application maximum temperature is 200 degrees F. or less and 500 psi, or Nordel for temperature up to a maximum of 275 degrees F. at 500 psi.

Pressure/temperature test ports shall be installed at each and all heat/cooling coil inlets and outlets. On coils with 3-way control valves an additional port shall be required between the control valve discharge and the balance valve or flow meter.

Provide test ports at the inlet and outlet of each and all pumps, hot water generators, cold water generators, coils, heat pumps, heat exchangers, storage tanks, and cooling tower supply and return piping unless permanently mounted pressure and temperature measuring devices are indicated elsewhere in the specifications or shown on the Drawings.

Test Plugs shall be Sisco, Pete's or equal.

END OF SECTION 220100

SECTION 220400 – PLUMBING

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100, General Provisions, in its entirety, including references to the General Construction Specifications, are hereby adopted and made part of these Specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete sanitary sewer systems and potable hot and cold water systems, as described herein and/or shown on the Drawings. This includes all piping, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

See Section 220700 for insulation requirements.

1.02 SYSTEM OF PLUMBING:

The continuous waste and vent method of plumbing shall be installed. Hot, tempered and cold water lines are to be installed where shown. All water piping in finished areas shall be concealed in joist spaces above ceilings, and in walls.

Pipes run overhead shall be placed as close to the ceiling as possible, to maintain proper headroom and to present a neat appearance, all consistent with the pitching of pipes for drainage of the systems.

The plumbing work shall be installed in strict accordance with the best plumbing practice, all subject to the Architect/Engineer's approval in accordance with all applicable local, state and national plumbing regulations.

1.03 PLUMBING VENT THRU ROOF (VTR):

Vent stacks from sewer, soil, waste and drain pipes shall be extended at least 12 inches above the roof. The top of the vent shall be designed so as to permit the insertion therein of a testing plug of such form that it can be readily seen until removed, and said plug shall be removed at once after final inspection has been made and approved by the Architect/Engineer. The minimum size of any vent passing through roof shall be 4 inches.

Vents at all sloped roofs shall be black in color above the roof line.

1.04 CLEANOUTS:

Full size brass screw cleanout plugs shall be furnished and installed at the bottom of all soil and waste stacks and at all points where shown on the Drawings and where necessary to permit the entire drainage system to be rodded out easily. Floor drains located in branch lines shall have cleanouts adjacent to the drains.

Floor cleanouts shall be cast iron with inside caulk ferrule, brass plug, adjustable housing and round nickel brass secured frame and scoriated cover. Wade covers shall be heavy duty. In ceramic and quarry tile floor finishes the cover shall be square. The cover shall be provided to accept the floor covering in the location being installed, i.e., synthetic covering, composition tile, terrazzo, etc., Zurn Z-1425, Wade W-6010; Josam 58100; or equal. Flashing clamp and collar shall be furnished with all cleanouts installed in floors having waterproof membranes. Wall and ceiling plates shall be Zurn Z-1469, Wade W-8480-R, Josam 58600, or equal.

Cleanouts shall be Wade, Zurn, Josam, Ancon, J. R. Smith, Mifab, Sioux Chief, Watts, or equal.

1.05 FLOOR DRAINS:

Furnish and install floor drains where shown on the Drawings and as specified or equal. All floor drains installed in floors with waterproof membranes shall have flashing clamps.

Floor drains except in mechanical rooms, garages and the like shall be Josam Series 30000-A, Wade W-1100 or equal with 5 inch diameter Nickaloy strainer having a minimum of 7.3 square inch free area. In ceramic and quarry tile floor finishes the floor drain strainer shall be square. Furnish and install a deep seal trap.

Floor drains in mechanical rooms shall be Josam Series 30000-E, Wade W-1100-TS or equal with heavy duty 8 inch diameter grate. Furnish and install a deep seal trap with cleanout.

Floor drains shall be Josam, Zurn, Wade, Smith, Ancon, Mifab, Sioux Chief, Watts, or equal.

1.06 FLOOR SINKS:

Furnish and install Josam Series 49320A-NB or equal Floor Sinks where shown on the Drawings. Floor sinks shall be square cast iron sanitary floor sinks with acid resisting interior, double drainage flange, integral aluminum dome strainer, nikaloy sanitary sloped rim and anti-tilting grate. Floor sinks shall be 6-1/4 inches deep with 10 inches square full grates except the floor sinks at the dish machine. The dish machine floor sink shall be 8-1/4 inches deep with 10 inches square 3/4 grate.

Floor Sinks shall be Josam, Zurn, Wade, Smith, Ancon, Mifab, Sioux Chief, Watts, or equal.

1.07 WASTE, VENT AND WATER CONNECTIONS TO FIXTURES:

Rough-in for waste, vent and water connections at the various fixtures shall be as follows, unless noted otherwise:

	Waste	Vent	Water
Water closet (tank)	4"	2"	1/2"
Water closet (flush)	4"	2"	1-1/4"
Urinal	2"	1-1/2"	1"
Lavatory	1-1/2"	1-1/2"	1/2"

Sink	2"	1-1/2"	1/2"
Kitchen sink	2"	1-1/2"	1/2"
Service sink and receptor	3"	1-1/2"	1/2"
Drinking fountain and EWC	1-1/4"	1-1/4"	1/2"

Waste, vent and water supply piping to plumbing fixtures and equipment which is not shown on the Drawings shall be provided and shall be amply sized in accordance with the above schedule. All plumbing fixtures, wastes, and drains shall be vented in accordance with all applicable Local, State and National Plumbing Regulations.

1.08 PLUMBING FIXTURES:

Furnish and install all plumbing fixtures as specified hereinafter and as designated on the Drawings. Catalog numbers shown are used to designate the type of fixture desired. Special equipment included in this schedule is identified by brand name and number.

Caulk around all floor and wall mounted fixtures. Caulking shall be done in a skilled manner with silicone based white acrylic latex caulk. Caulking shall be water tight, flexible, mildew and shrink resistant.

All exposed flush, waste and supply pipes at the fixtures shall be chromium-plated brass pipe, iron pipe size. No steel nipples or cover tubes will be allowed. The stop valves, pop-up wastes, flush valves, etc., shall be heavy cast brass chromium-plated. Waterlines to all the individual fixtures, where exposed, shall be equipped with high grade, loose key chromium plated brass stop valves unless scheduled otherwise on the Drawings. All chromium plating shall be applied over a nickel plated base. Enameled fixtures shall be acid resistant. Provide backing in the wall to support the fixture. All water closets shall have bolt caps with retainer clips. Groups of fixtures shall be matched.

The Schedule shown on the Drawings is given for the convenience of the Contractor who is to be responsible for exact quantities. Any fixtures indicated on the Drawings, but not specifically mentioned in the Specifications or scheduled, shall be furnished by the Contractor.

Plumbing Fixtures shall be as scheduled, American Standard, Crane, Briggs, Kohler, Sloan, Vitra, Zurn-One, or equal.

Fixture carriers shall be Josam, Wade, Zurn, Blake, Smith, Watts or equal.

Brassware shall be the manufacturer's own brass, Chicago Faucet, T&S Brass, Speakman, Cambridge Brass, Zurn, American Standard, as scheduled or equal. Faucets shall meet NSF Standard 61, Section 9 for drinking water.

Lavatory faucets shall have a five year minimum warranty against leaking and shall be equipped with temperature limit stops and vandal resistant aerators. Faucet bodies shall be chrome-plated

zinc die-cast or solid cast brass (polished or chrome plated) as scheduled on the Drawings. Lavatory faucets shall be American Standard, Delta, Moen, Zurn, Chicago/Geberit, Kohler, Sloan, Bradley, Speakman, T&S Brass, Cambridge Brass, or equal.

Fiberglass shower enclosures shall be Warm Rain, Aqua Glass, Lasco, Kohler, Aquarius or equal.

Mop sinks shall be Fiat, Stern Williams, Swan, Mustee, Zurn as scheduled or equal.

Stainless Steel sinks shall be Elkay, Carlton, Just, as scheduled or equal.

Water Closet seats shall be as scheduled, Centoco, Church, Bemis, Beneke, Sperzel, Olsonite, or equal.

Flush Valves shall be as scheduled, American Standard, Sloan , Zurn or equal.

1.09 CIRCULATING PUMPS:

Furnish and install Bell and Gossett Model PL or equal in-line circulating pumps on the hot water circulating piping where shown on the Drawings.

Pumps shall be horizontal, permanently lubricated type, specifically designed and guaranteed for quiet operation and suitable for 150 psi working pressure.

The pumps shall have a steel shaft supported by permanently lubricated, sealed precision ball bearings. The pumps are to be equipped with a water-tight seal to prevent leakage. Mechanical seal faces shall be carbon on silicon carbide. The motor shall be non-overloading at any point on the pump performance curve.

The pump shall be of all bronze construction suitable for domestic water use.

The motor shall be of the drip-proof, sealed precision ball-bearing, quiet-operating construction. The permanent split-capacitor motor shall be equipped with thermal overload protection.

Pumps to be suitable for 225 degrees F (107 degrees C) operating temperature at 150 psig (10 bar) working pressure.

The pump shall be directly driven, 115 volt, 60 cycle, 1 phase motor.

Capacities shall be as scheduled on the Drawings.

Circulating Pumps shall be Bell & Gossett, Taco, Armstrong, Amtrol or equal.

1.10 SHOCK ABSORBERS:

Piping shall be installed with proper safeguards to prevent water hammer. This will be done by installing a sufficient number of shock absorbers where indicated on the Drawings.

The commercial shock absorbers indicated on the Drawings shall be sized as follows:

Size	Fixture Units

SA-1	1 -11
SA-2	12-32
SA-3	33-60
SA-4	61-113
SA-5	114-154
SA-6	155-330

Shock Absorbers shall be Josam, Wade, Zurn, Sioux Chief or equal.

1.11 WALL HYDRANTS:

Furnish and install 3/4 inch freezeless type wall hydrants where shown on the Drawings. Wall hydrants shall be Woodford Model 65 or equal, modular brass body with brushed chrome finish and self-draining vacuum breaker. Operating stem shall be hardened stainless steel with loose-key operator. Provide a key with each hydrant and unless stated otherwise, the hydrant shall be installed 24 inches above finished grade. The Contractor shall verify the required operating rod assembly length based on wall thickness.

Wall hydrants shall be Woodford, Zurn, Smith, Watts or equal.

1.12 HOSE BIBBS:

Furnish and install Chicago No. 387 or No. 387-LF or equal, hose bibbs where shown on the Drawings. Hose bibbs shall have 3/4 inch thread inlet, 3/4 inch hose thread outlet, and rough chrome plate finish with vacuum breaker. Unless noted otherwise, the hose bibbs shall be installed 42 inches above finished floor. Provide unit with flanged inlet for concealed piping and less flange for exposed piping.

1.13 ELECTRIC WATER HEATERS:

Provide electric water heater where shown on the drawings. See schedule sheet for capacities. Water heater(s) shall have the UL seal of certification and be factory equipped with an CSA/ASME rated temperature and pressure relief valve. Tank(s) interior shall be coated with a high temperature porcelain enamel and furnished with a magnesium anode rod rigidly supported. Water heater(s) shall meet or exceed the energy factor requirements of ASHRAE. Tanks shall have a working pressure rating of 150 psi, and shall be completely assembled. Water heater(s) shall be equipped with copper, resistored, “screw-in” type elements. Tank shall be insulated with 2-1/2" of rigid polyurethane foam insulation. Water heater(s) shall be equipped with surface mounted thermostats each with an integral, manual reset, high limit control. Water heater(s) shall be covered by a three year limited warranty against tank leaks.

Water heaters shall be Crane, State, Rheem, Jackson, A. O. Smith, American, PVI, Lochinvar, Bradford White or equal.

1.14 WATER SERVICE MAIN:

Furnish and install a water service as shown on the Drawings. The water meter shall be purchased from the City or shall be of the type approved by the City. All outside water piping shall be installed at a minimum depth of 6'-0" below finished grade.

All underground piping for fire mains shall be installed, clamped, anchored, flushed and hydrostatically pressure tested according to the requirements of the authorities and agencies having jurisdiction and NFPA Pamphlets No. 13 and 24.

The Contractor shall furnish and install all concrete thrust blocks required for anchoring of the underground fire main. Thrust blocks shall be capable of restraining piping at test pressure of 200 psig.

1.15 SANITARY SEWER SERVICE:

Furnish and install sanitary sewer service as shown on the Drawings. The service within 5'-0" of the building and as designated on the Drawings shall be cast iron or PVC pipe and fittings. The service shall be extended at a uniform grade. The Contractor shall verify all invert elevations before beginning excavations.

The complete installation shall be in accordance with all applicable, Local, State, and National plumbing regulations.

1.16 GAS SERVICE:

Outside gas service to the meter location shown on the Drawings along with the gas meter and pressure regulator, will be installed by the Local Gas Company. Any costs for installation and/or relocation of outside gas service, shall be paid by the Contractor, and this cost shall be included in the Contractor's Base Bid.

1.17 MIXING VALVE (POINT OF USE TYPE):

Furnish and install an ASSE Thermostatic Mixing Valve on the hot water supply of all hand-washing sinks or lavatories. The Contractor shall confirm which sinks require 1070 valves, but typically restroom lavatories, kitchen hand-wash sinks, exam room hand-wash sinks do, while kitchen, breakroom, laundry, service type sinks do not.

The valve shall be ASSE Standard 1070 and IAPMO cUPC listed and control the temperature of the hot water. It shall have a Lead Free* brass body. Valve may be an “H” or “T” pattern. Install valve and tubing/hoses in a uniform manner below the fixture. Thermostatic valves shall comply with state codes and standards, where applicable, requiring reduced lead content. The valve shall include integral check valves, integral screens and an adjustment nut with locking feature. The valve shall be provided with 3⁄8" (10mm) male compression fittings. Adjustable temperature range shall be approximately 80 deg. F. to 120 deg. F.

Valves shall be MCC Powers, Lawler, Symmons, Leonard, Watts Regulator, Powers Controls, Proflow, or equal.

1.18 REDUCED PRESSURE BACKFLOW PREVENTER:

Furnish and install Watts Regulator Co. Series No. 009-S, 909-S or equal reduced pressure backflow preventer. Where shown, the backflow preventer shall be a complete assembly including tight-closing shut-off valves before and after the device and also be protected by a strainer. The design shall include test cocks and a pressure-differential relief valve located between two positive seating check valves.

The device shall meet the requirements of A.S.S.E. Standard 1013 and A.W.W.A. Standard C506. Unit vent outlet shall have a suitable connection for an air gap and shall be provided with an air gap fitting piped to a floor drain.

After installation the backflow preventer shall be tested and certified by a licensed technician.

Reduced pressure backflow preventers shall be Watts, Hersey, Conbraco, Febco, Wilkins or equal.

1.19 ELECTRIC WATER COOLERS (TWO LEVEL):

Furnish and install a two level electric water coolers where shown on the Drawings. Units shall have light touch push bars, bottle filler, bubblers, pressure regulator, hermetic compressor, stainless steel tops and receptors, stainless steel cabinet faceplate. Units shall be air cooled with fractional horsepower, 115 volt, single phase motor including integral thermal overload protection and 3-wire grounded plug. Entire unit shall be guaranteed for 5 years.

The electric water cooler shall be ADA compliant and shall be lead free.

Furnish the cooler with a cane apron under the upper unit when the cooler is not installed in a recessed area.

Handicapped units shall be mounted with the outlet orifice at 36" maximum and standard units shall be mounted with the outlet orifice at 42" above finished floor unless noted otherwise on the Drawings.

Water cooler capacity shall be 7.6 gph of 50 degrees F. water with an 80 degrees F. inlet water temperature and 90 degrees F. ambient room temperature.

Water Coolers shall be Elkay, Oasis, Halsey-Taylor, Sunroc, General Electric, Haws or equal.

1.20 THERMAL EXPANSION ABSORBER:

Furnish and install a Thermal Expansion Absorber where shown and scheduled on the Drawings.

The steel tank shall have a flexible bladder separating air and water. The tank shall have a pressure rating of 150. Tanks installed for water heaters with 200,000 btuh input and greater shall conform to Section VIII of the ASME Unfired Pressure Vessel Code Standards.

Thermal Expansion Absorber shall be Amtrol, Armstrong, Taco, Elbi or equal.

1.21 TESTS:

The following tests shall be performed on the respective systems. Tests shall be repeated until each system is proven acceptable.

The Contractor is responsible for the following tests:

Soil, waste, and vent piping and rain water conductors, etc., shall be tested in accordance with applicable state and local codes. Unless stated otherwise in the applicable codes, these systems shall be tested with 5 psi air pressure for a period of 15 minutes with a maximum drop of 1 psi during this period.

Cold, hot and recirculating hot water shall be tested and proven watertight under a hydrostatic pressure of 100 psi.

END OF SECTION 220400

SECTION 220600 - HEATING

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100, General Provisions, in its entirety, including references to the General Construction Specifications, are hereby adopted and made a part of these specifications.

The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete heating system as described herein, and/or as shown on the Drawings. This includes all piping, equipment, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

See Section 220700 for insulation requirements.

1.02 CABINET UNIT HEATERS (CUH):

Furnish and install Cabinet Unit Heaters where shown on the Drawings. Types, sizes and performance shall be as tabulated in the schedule on the Drawings.

Floor type cabinets shall be a vertical console type enclosure fabricated of galvanized steel, phosphatized and finished in a baked enamel with the color to be selected by the Architect/Engineer from a standard color chart. Cabinet shall include integral bar front discharge grille and full width electrical and piping compartments with access doors at each end.

Basic unit shall consist of base casing with wall plate fabricated of galvanized steel, top duct discharge opening or for installation in custom enclosure.

Horizontal cabinet models shall consist of 18 gauge steel panels. Bottom and end panels shall have channel formed edges around the entire panel perimeter. Integral, stamped outlet and inlet grilles, where required, shall have 15 degrees downward deflection. Bottom panel shall be hinged at the front and camlocked at the back.

Horizontal recessed models shall consist of 18 gauge steel removable, four-sided overlapped bottom panel with piano-type hinge at the back and camlocks at the front. The fan shall be enclosed with a filter rack at the inlet.

Coils shall have aluminum fins with copper tubes mechanically expanded for a permanent bond. Coils shall have a factory installed manual air vent. Coil performance shall be as tabulated in the schedule on the Drawings.

Fans shall be DWDI forwardly curved, centrifugal type. Fan housing shall be fabricated of heavy gauge galvanized steel and of 2-piece construction with removable front half for complete access to fans.

Units shall have 115/60/1 single speed, sleeve bearing, permanent split capacitor motors with oilers, inherent thermal overload protection with automatic reset, disconnect switch and resilient mounts.

Units shall have a unit mounted solid state variable speed controller with integral "on-off" switch which shall provide "high","medium","low" fan speed control. All capacities are based on high fan speed.

Cabinet Unit Heaters shall be Trane, McQuay, Airtherm, Carrier, Beacon Morris, International, Dunham-Bush, Sterling, York, Modine, Rittling, Sigma or equal.

1.03 PROPELLER UNIT HEATERS:

Furnish and install Propeller Unit Heaters where shown on the Drawings. Unit sizes, types, performance and equipment shall be as tabulated in the schedule on the Drawings.

Cabinet shall be manufactured from die formed heavy gauge continuous galvanized steel. Cabinets shall be finished with a baked-on enamel to provide durable protection. Horizontal unit heaters shall have adjustable louvers for adjustable air flow.

Units shall have 115/60/1 single speed, sleeve bearing, permanent split capacitor motors with oilers, inherent thermal overload protection with automatic reset and resilient mounts. Units shall have a unit mounted “on-off” switch.

Manufacturer shall provide all units with fan guards which meet OSHA requirements.

Units shall be furnished with high efficiency coils. Standard coils shall be rated up to 150 PSIG and up to 366 degrees F in temperature. High pressure coils shall be rated for up to 350 PSIG and 450 degrees F in temperature. All units with steam pressure above 25 PSIG shall have high pressure coils.

Down flow units shall be provided with double deflectors where indicated on the schedule. Horizontal air flow units shall have double deflection louvers.

Propeller Unit Heaters shall be Trane, McQuay, Airtherm, Carrier, Beacon Morris, Dunham-Bush, Sterling, Modine, Rittling, Sigma or equal.

1.04 HOT WATER RADIANT CEILING PANELS:

Furnish and install Hot Water Radiant Ceiling Panels where shown on the Drawings. All radiant panels shall be installed by personnel wearing white gloves to avoid soiling the panels. The ceiling supplier shall instruct the Contractor's personnel as to proper installation procedures.

Contractor shall refer to Room Finish Schedule and Architectural and Mechanical Drawings for locations of surfaces to be covered with various types of radiant metal pan units. Also refer to the architectural details which apply to this installation.

The radiant-acoustical panels shall produce a minimum heating output of 150 BTU per hour per square foot at 155 degrees F. mean water temperature (M.W.T.) and 195 BTU per hour per square foot at 175 degrees F. mean water temperature (M.W.T.) in a room with 70 degrees F. air temperature, 67 degrees F. average unheated surface temperature, natural air convection, and one inch of three quarter pound density fiberglass insulation placed on the top side of the panel.

Radiant heating panels shall be non-perforated panels, consisting of 0.040" aluminum face plate, 6 pass 1/2" copper serpentine coil metallurgically bonded to face plate, 1" thick 3/4 lb. density glass fiber pads, and shall be of sizes as shown on Drawings.

All metal ceiling panels shall have two coats, baked white polyester finish, with a light reflection value of 70% to 80%.

It is the responsibility of this Contractor to coordinate his work with the reflected ceiling plans. Provide surface mount; Airtex Model ASF, or equal; or recess mount; Airtex Model ARF, or equal; trim kits wherever panels are mounted in plaster or gyp board ceilings. Frames shall be single piece, aluminum exterior frames with welded corners. Recess mounting frames shall be used whenever possible.

No installation of finished ceiling surface panels or sound absorbing elements shall begin until all glazing has been completed and all exterior openings closed in. All wet work, including cement, plastering, terrazzo, etc., shall be completed and dried out before finished ceiling panels are installed. Any or all trades responsible for the damage of ceiling panels due to unauthorized removal, and other neglects, shall be held responsible for the replacement of such parts.

Hot Water Radiant Ceiling Panels shall be Airtex, AeroTech, Airtite, Barcol Air, Price, TWA, or equal.

1.05 STRAINERS:

Furnish and install, where shown on the Drawings, and where required, a "Y" type strainer.

Strainers shall have steel or brass bodies, with 20 mesh stainless steel screens. The pressure drop shall not exceed 0.1 PSI at rated flow. All strainers shall be rated at 125 psig steam working pressure minimum and 200 psig water working pressure minimum. All strainers shall be provided with a blowdown valve.

Strainers shall be Hoffman, Dunham-Bush, Sarco, Clark-Reliance, Armstrong, Illinois, Titan or equal.

1.06 AIR VENTS:

On each heating and cooling element, at the top of each heating or cooling pipe riser, and wherever required to vent the system, furnish and install a Taco No. 400, Bell & Gossett No. 4V or equal air vent.

1.07 HEATING AND COOLING ELEMENT VALVING:

Hot Water Radiation, Convectors and Unit Heaters: Install shutoff valves on the supply side of the coil and balancing valves on the return side. Where temperature control valves are used, the manual valves shall be installed to isolate both the temperature control valve and the coil.

Hot Water Coils: Provide shutoff valves on the supply to the coils and a balance valve on the return from the coils. Multiple section coil banks shall have the respective supply and return valves on each section.

See Drawings for additional valving requirements.

1.08 IN-LINE CIRCULATING PUMPS:

Furnish and install "in-line" centrifugal circulating pumps similar to Bell & Gossett Series 60, 80 or equal.

Pumps shall be complete with cast iron volutes, bronze impellers, carbon steel shafts, and mechanical seals. Bronze sleeve pump bearings shall be oil lubricating. Pump and motor shall be close-coupled with a flexible spring type coupler for quiet operation.

Pump capacities shall be as listed in the schedule on the Drawings.

Circulating pumps shall be Bell & Gossett, Taco, Armstrong, Amtrol, Patterson or equal.

1.09 SUCTION DIFFUSERS:

Provide at each end suction pump a suction diffuser at the inlet to the pump. Units shall consist of angle type body with straightening vanes and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped with a disposable fine mesh strainer which shall be removed after system start-up. Orifice cylinder shall be designed to withstand pressure differential equal to pump shutoff head and shall have a free area equal to five times cross section area of pump suction opening. Straightening vanes shall extend the full length of the orifice cylinder and shall be replaceable. Unit shall be provided with adjustable support foot to carry weight of suction piping.

Suction Diffuser shall be Bell & Gossett, Mueller Steam Specialty, Victaulic, Taco, Shurjoint, Armstrong or equal.

1.10 EXPANSION TANK (BLADDER TYPE):

Furnish and install Bell and Gossett Model B, or equal pre-charged steel expansion tank with replaceable heavy duty Butyl rubber bladder where shown on the Drawings.

The tank shall have a 1-1/2" NPT system connection, 3/4" NPT drain, and a .302" -32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.
The tank shall be fitted with lifting rings and a floor mounting skirt for vertical installation.

The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped 125 psi working pressure.

Expansion tank shall be Amtrol, Armstrong, Bell & Gossett, Taco, Elbi or equal.

1.11 AIR SEPARATORS:

Furnish and install Bell & Gossett Model RL Rolairtrol air separator(s) or equal, where shown on the Drawings. Unit shall be constructed in accordance with ASME Code and stamped for 125 psig working pressure. Air separators shall have 90 percent minimum efficiency and head loss shall not exceed 3.0 feet at rated flow.

Air separator for the heating system shall be Model RL-3having a capacity of 190 gpm minimum.

Air Separators shall be Amtrol, Armstrong, Bell & Gossett, Taco or equal.

1.12 HIGH CAPACITY AIR VENT:

Furnish and install as shown on Drawings a float actuated non-modulating high capacity air vent designed to purge free air from the system and provide positive shutoff at pressures up to 150 psig at a maximum temperature of 250 degrees F. The design of the high capacity air vent shall prevent air from entering the system if system pressure should drop below atmospheric pressure. The high capacity air vent shall be pilot operated for intermittent purging of free air at pressures up to 2 psig during normal system operation, and diaphragm operated for full capacity purging of free air at pressures between 2 and 150 psig. The high capacity air vent shall be constructed of cast iron and fitted with components of type 313 stainless steel, brass, EPDM and silicone rubber.

The high capacity air vent shall be Bell & Gossett, Taco, Armstrong or equal.

1.13 BOILER(s):

Furnish and install a Fulton Endura XE series boiler stainless steel firetube boiler as shown and scheduled in the Drawings.

Boilers shall be factory- fabricated, -assembled, and -pressure tested, ferritic stainless steel firetube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including flue gas vent and combustion air intake connections, water supply, water return, condensate drain, and controls. The boiler, burner and controls shall be completely factory assembled as a self-contained unit. Each boiler shall be neatly finished, thoroughly tested, and properly packaged for shipping. For closed-loop water heating service only.

The pressure vessel shall be designed and constructed in accordance with Section IV of the ASME Code for heating boilers. The pressure vessel shall be a counter-flow design with internal water-baffling. The boiler return and supply water connections shall be NPT or ANSI Flanged. The water connections shall not be designed to support an external structural load from the piping system. To ensure heat exchanger longevity, the pressure vessel shall be a high volume design with a water volume to heat capacity ratio of not less than 16.0 Gallons per MMBTU/hr. The maximum water pressure drop across the boiler inlet and outlet connections at a high-fire 20°F delta-T condition shall not exceed 3 psi.

The heat exchanger is defined as the surfaces of the pressure vessel where the heat of combustion gases is transferred to the hydronic heating liquid. The boiler shall be a single-pass firetube design, such that all combustion chamber components are within water-backed areas. Watertube boilers will not be accepted. The furnace to tube connections shall be constructed with low weld heat intensity, a tube to tube minimum spacing of 2 tube diameters center to center, minimum 1 tube diameter tube to tube ligament, and shall not contain any overlapping welds. Heat transfer capability shall be maximized via the use of corrugated firetubes. The corrugation process shall not remove any material from the tubes. Finned, twisted tape, or coil type tube inserts negatively impact ease of maintenance and will not be accepted. To ensure long heat exchanger life, the design shall be such that tubesheet to tube weld stresses while the boiler is in operation shall never exceed 3.5 ksi. Alternate boilers to the basis of design model and manufacturer shall provide a factory Finite Element Analysis (FEA) report detailing compliance, no exceptions will be granted.

The heat exchanger furnace, tubesheets, and firetubes shall be constructed of ferritic alloy stainless steel. Austenitic stainless steels such as 316Ti, 316L and 304 provide insufficient yield strength and are subject to catastrophic Chloride Stress Corrosion Cracking failure, and thus are not accepted. Heat exchangers constructed of cast aluminum, mild steel, cast iron or copper finned tube materials are not accepted.

The exhaust manifold shall collect flue gases and flue gas condensate for safe disposal and shall be of stainless steel construction.

The burner shall be forced draft and utilize natural gas. Air and gas pre-mix on the suction side of the fan with ratio controlled electronically by a Flame-by-Wire™ combustion control system. Burner modulation ratio shall be no less than 10:1. When operating on natural gas, the burner shall maintain a level of <20 ppm over the complete combustion range at a 3% O_2 correction. Ignition shall be from an automatic direct spark ignition electrode or pilot ignition system.

The boiler blower shall be a variable speed centrifugal fan to operate during each burner firing sequence and to pre-purge and post-purge the combustion chamber. Motor shall be a closed-loop brushless DC variable speed motor with hall effect sensor feedback; internal electronic commutation controller with built in speed control and protection features; long life, sealed, ball bearing with high temperature grease.

A factory mounted fuel train shall be supplied. The fuel train shall be fully assembled, leak tested, and enclosed within the boiler cabinet. Burners with inputs exceeding 400,000 BTU/hr. the gas train shall be complete with factory mounted and wired high and low gas pressure switches in compliance with CSD-1.

The boiler enclosure shall be jacketed steel enclosure with full height front access door, fully removable access panels, mounted on a steel skid with steel plate decking. The control enclosure shall be equivalent to NEMA 250, Type 1. Cabinet shall be powder coated. The combustion air collar shall be located on the boiler cabinet.

The boiler shall fit through a standard 36-inch door without requiring disassembly.

Provide a ASME rated 60 PSIG safety relief valve.

Provide a minimum 3-1/2” diameter, combination pressure and temperature gauge.

Provide a flue gas condensate drain trap to prevent positive pressure exhaust gases from entering the boiler room.

Boiler shall have an integrated control panel and shall include the following factory mounted and wired devices:

1. User Interface: 5-inch color touchscreen control display on the front exterior panel. The user interface shall allow access for configurating parameters, boiler control and monitoring; and shall feature a screen saver, boiler status, configuration, history and diagnostics.
2. Flame Safeguard.
3. Field Connections Terminals.
4. Controls Transformers and Power Supplies: 24VAC, 24VDC, 5VDC

To maintain safe operation conditions, provide the following factory mounted and wired burner safety controls and limits:

1. High Limit: A manual reset electronic high temperature device shall stop the burner if operating conditions rise above maximum boiler design temperature.
2. Low-Water Cut Off: Electronic probe type mounted in the pressure vessel shall prevent burner operation on low water alarm.
3. Air Safety Switch: Prevent operation unless sufficient blower pressure is proven.

To maintain the ration of fuel to air throughout the burner modulation range provide the following:

1. Flame-by-Wire™ or equivalent electronic combustion control system shall be provided to empower technicians to accurately dial-in positions electronically. The system shall feature O_2 Compensation™ or equivalent to continuously tune the burner air-fuel ratio in real-time, automatically adjusting for changes in seasonality to maximize combustion efficiency and condensate production for greater energy savings and reduced emissions. Pneumatic ("negative regulation", "zero governor") type systems offer far less precision and are not capable of independent air and gas control and are not accepted.
2. The air and gas motor position tolerances shall be no greater than +/- 0.1° to allow for much more precise control of air-fuel ratio compared to linkages that may slip, or pneumatic gas valves which drift over time and have difficulty handling environmental and installation fluctuations.
3. Combustion air flow shall be controlled by variable fan speed and a closed-loop motor actuated butterfly valve with position feedback.
4. Gaseous fuel flow shall be controlled by a separate closed-loop motor actuated butterfly valve with position feedback.
5. The air/fuel ratio shall be optimized across the entire modulation range through the use of a non-linear combustion curve. Ignition, low fire to high fire shall be comprised of ten (10) total points where each point includes discrete electronic parameters for fan speed, air position, and gas position. Two (2) point controls only allow for low fire and high fire settings, are incapable of generating a non-linear combustion curve, and thus will not be accepted.
6. O_2 Compensation™: 100% duty cycle system to maximize efficiency throughout seasonality:
    a. The system shall autonomously adjust the fuel-air ratio during operation thereby reducing emissions and optimizing heating reliability, combustion efficiency, and the dewpoint temperature for formation of flue gas condensate.
    b. O_2 feedback or monitoring-only type systems that cannot automatically adjust combustion for seasonal variability shall not be accepted. Systems that trim at less than a 100% duty cycle are unable to account for rapid changes in operating conditions and shall not be accepted.

Provide the following temperature and operating controls and instrumentation:

1. Outlet (supply) operating water temperature sensor: Sensor shall be dual-element type.
2. Inlet (return) water temperature sensor.
3. Combustion air temperature sensor.
4. Flue gas exhaust temperature sensor: Probe shall be stainless steel.
5. Proportional Integral Derivative (PID) temperature load control capability for hydronic and domestic hot water in standalone or lead-lag operation.
6. Time of day display.
7. Customizable boiler name display.
8. Alarm history for a minimum 100 most recent alarms including status at time of lockout.
9. Administrative password protection options.
10. Outdoor air temperature (OAT) reset controls with warm weather shutdown:
    a. OAT reset shall automatically adjust the setpoint according to changes in the outdoor air temperature, and disable the boilers above a configurable outdoor air temperature.
    b. The boiler manufacturer shall provide an OAT sensor.
    c. The temperature sensor shall be field installed in an outdoor area not exposed to direct sunlight or the exhaust of other mechanical equipment, and wired the boiler controller.
    d. The control shall be field programmed with the outdoor reset schedule.

Provide primary boiler pump control with a dry contact start/stop signal shall be provided. The contact shall be configurable to close upon local burner demand and shall open after a time delay when burner demand ends.

Provide the appropriate hardware and software to enable the building automation system to monitor, control and display boiler status and alarms. Coordinate with BAS supplier.

Provide factory-installed and factory-wired switches, transformers, control and safety devices and other devices for a single-point field power connection to the boiler.

The boiler shall be capable of operating with a stack effect up to -0.10” W.C. and a combined air intake and exhaust venting pressure drop up to 1.0” W.C. Combustion air shall be taken from the outdoors. Flue gas exhaust stack shall be flame resistant polypropylene, listed and labled to UL-1738 for use with Category II/IV appliances, guaranteed appropriate for the application by the manufacturer and supplier of the venting.

Condensate drain piping shall be CPVC.

All boilers shall be factory tested and inspected, before shipping, according to the ASME Boiler and Pressure Vessel Code.

Boilers shall be Fulton, Lochinvar, Aerco, or approved equal.

1.14 BOILER VENTING

Furnish and install a Polypropylene gas venting systems on high efficiency gas fired appliances. The systems shall be installed in accordance with the manufactures Installation and Maintenance Instructions and with all applicable local, regional, and national codes.

The vent shall be of the single wall, factory-built type, designed for use in conjunction with Category II, or IV condensing gas fired appliances, condensing oil fired appliances or as specified by the heating equipment manufacturer.

Maximum continuous flue gas temperature shall not exceed 230 degrees F (110 degrees C).

Vent shall be listed for a maximum positive pressure rating of 20" w.c.

The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All systems components shall be UL/cUL listed and supplied by the same manufacturer.

The vent shall be constructed from Flame Resistant Polypropylene, with a min. wall thickness of:

Diameter		*Wall thickness extruded pipes*			
Diameter (mm)	*diameter (inch)*	*min (mm)*	*max (mm)*	*min (inch)*	*max (inch)*
DN 60	2"	1.7	2.2	0.0669	0.0866
DN 80	3"	1.8	2.4	0.0709	0.0945
DN 110	4"	2.4	3.2	0.0945	0.1260
DN 125	5"	2.7	3.7	0.1063	0.1457
DN 160	6"	2.9	4.5	0.1142	0.1772
DN 200	8"	3.5	4.5	0.1378	0.1772
DN 250	10"	3.3	4.7	0.1299	0.1850
DN 315	12"	4.2	5.8	0.1654	0.2283

All systems components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be UL/cUL listed and provided by the vent manufacturer.

All systems components shall include a factory- installed gasket in their female-end to render the vent air and watertight when the male/female ends are pushed together as per manufacturer's instructions. Vent systems requiring field installed sealants or compounds shall not be acceptable.

Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.

The vent system shall be routed for zero clearance to combustibles as specified by the manufacturer. Vent Installation shall conform to the manufacturer's installation instructions, its UL/cUL listing and state/local codes. The vent system and breechings shall be inspected and cleaned before the final connection to the appliances.

Vent systems shall be Centrotherm, Duravent, or equal.

1.15 WATER TREATMENT:

Water treatment work shall be executed under the direct supervision of an independent water treatment company with personnel experienced in hydronic and steam system water treatment having an experience record of not less than five (5) years in the water treatment industry. System cleaning and treatment work shall not be done by the installing contractor without the proper supervision.

A certificate of completion of the system cleaning and treatment shall be provided by the Water Treatment Company.

The heating and cooling equipment shall not be fired nor shall the circulating water systems be operated prior to cleaning and treatment.

The Water Treatment Company shall provide a description of the water treatment and glycol in the individual systems and shall mount the descriptions with heavy plexiglass covers on the wall adjacent to the chemical feeder for each respective system.

Acceptable Water Treatment Companies meeting the above requirements are as follows:

Fremont Industries
EcoLab
Garratt Callahan
Girton-Adams

Independent Water Treatment Companies not listed above must submit for approval. This approval is not required prior to the bid; however, must be completed prior to any treatment work being done and is at the sole discretion of the Architect/Engineer.

Cleaning and Flushing:

All boilers and heating circulating water system piping, and equipment shall be thoroughly flushed out with cleaning chemicals at a temperature of 140 degrees F. to remove all pipe dope, oils mill scale, and other extraneous materials. The system may require multiple cleaning and flushing of the system to accomplish adequate low temperature cleaning and flushing. The system shall then be filled immediately with clean water and flushed, refilled with clean water to which water chemical treatment shall be added in the prescribed dosage.

Circulating Water System Treatment (Heating and Cooling):

Chemical feeding equipment for closed systems shall be a filter feeder with 5 gallon capacity. The filter feeder shall be rated at 200 psi and 212 degrees F. Filter bags shall be 5 micron filters with 1.95 square feet filter area. Feeder drain shall be routed to the nearest floor drain. Filter feeder shall be Garrett-Calahan Company Model FTF-5, Neptune FTF-5, Wingert or equal.

Provide a one (1) year's supply of liquid polymeric corrosion inhibitor treatment for the prevention of corrosion in closed systems at 20 ppm total phosphate level. Systems with 25 percent by volume or greater concentrations of specially inhibited glycol may not require additional corrosion inhibitor.

Testing Equipment:

Supply a one year's quantity of testing chemicals to properly the closed system water for phosphate. Furnish the necessary test kits for these tests.

Furnish a supply of log sheets on which to record the test results and bound copy of full test instructions.

Service and Control:

The water treatment company shall provide the services of a fully qualified service representative for one year at no additional cost to the Owner. This service representative must have been active in the water treatment field for a minimum of five years.

The water treatment company shall train the operating personnel as to the proper testing procedures and applications of his products for proper treatment.

The water treatment company shall make technical service visits to the site of the Owner to perform field inspections and to make water analyses on site, both of such complexity as to evaluate the water systems operations. The service representative shall provide findings to the proper personnel in writing on proper practices, chemical treating requirements, and any corrective actions needed to protect the water systems from scale, corrosion, and fouling.

Heating Water Systems: November and February.

The water treatment company shall be on call at no additional cost to the Owner to make on site inspections of equipment during scheduled or emergency outages in order to properly evaluate the success of the water treatment program, and to make recommendations in writing based upon these inspections.

Water Treatment chemical shall be Fremont Industries, Ecolab, Girton-Adams or equal.

1.16 HEATING AND COOLING SYSTEMS COIL DAMAGE PROTECTION:

Furnish and install Dow Chemical Company Dowfrost HD or equal specially inhibited propylene glycol-based fluid in the heating and cooling circulating water systems to minimize the risk of coil damage. The glycol based fluid shall be a premixed fluid provided by the glycol supplier.

Circulating heating water systems shall incorporate 25 percent propylene glycol by volume.

Specially inhibited glycol shall be Dow Chemical Company, Fremont Industries, Houghton Chemical Company, Interstate Chemical Company, Rhomar Water, Union Carbide, or equal.

1.17 GAS SERVICE:

Outside gas service to the meter location shown on the Drawings along with the gas meter and pressure regulator, will be installed by the Local Gas Company. Any costs for installation and/or relocation of outside gas service shall be paid by the Contractor, and this cost shall be included in the Contractor's Base Bid.

1.18 AUTOMATIC TEMPERATURE CONTROL:

Install the automatic temperature control valves, openings for water monitoring devices, flow switches, wells, alarms and control devices as provided by the Automatic Temperature Control Contractor. These valves and devices shall be installed under the direct supervision of the Section 230900, AUTOMATIC TEMPERATURE CONTROL Contractor and in strict accordance with the manufacturer's recommendations.

1.19 CALIBRATED BALANCE VALVE:

Furnish and install a Bell & Gossett Circuit Setter or equal calibrated balance valves of the sizes shown on the Drawings. Valves 3 inch size and smaller shall be Model CB and over 3 inches shall be Model OP. Each valve setter shall be of bronze construction for 125 psi and 250 degrees F.

Each valve in cold piping shall have an extended operator stem with insulation sleeve and extended pressure/temperature test ports to accommodate the pipe insulation and vapor barrier.

All valves shall include a balance valve either integral with the calibrated balance valve or immediately downstream from the flow fitting.

Calibrated Balance Valves shall be Bell & Gossett, Taco, Gerand, Flowset, Presco, Victaulic, Nexus, Pro Hydronics, Hays, or equal.

1.20 AUTOMATIC FLOW CONTROL VALVES:

Contractor shall provide and install Automatic Pressure compensating Automatic Flow Control Valves where shown on the Drawings. Each kit shall include an Automatic Flow Control Valve, two shut-off valves, and various accessories. Contractor shall provide replacement cartridges as necessary for system balancing.

Automatic Flow Control Valves (FCV) shall automatically control flow rates with +/- 5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. Two operating pressure ranges shall be available with the minimum range requiring less than 3 PSID to actuate the mechanism. Valve internal control mechanism shall consist of a passivated stainless steel one-piece cartridge with segmented port design and full travel linear coil spring. Dual pressure or pressure/temperature test valves for verifying the pressure differential across the cartridge and system temperature shall be standard. Manufacturer shall provide certified independent laboratory tests verifying accuracy of performance.

Ball Valves integral to the automatic flow control valves shall be made of Bronze and rated for 600 WOG.

P/T Adapter for supply side shall include a pressure/temperature test valve for measuring temperature and/or pressure differential across the terminal unit. Provide a metal identification tag with chain for each installed valve. The tag shall be marked with zone identification and rated flow in gpm.

All components shall be warranted by manufacturer for no less than five years from date of purchase.

Correct flow shall be verified by establishing that the operating pressure differential across the valve tappings is within the range indicated on the submittal data sheet for that model number.

Each valve in cold piping shall have an extended operator stem with insulation sleeve and extended pressure/temperature test ports to accommodate the pipe insulation and vapor barrier.

Automatic Flow Control Valves shall be Griswold, Autoflow, Nexus, Pro Hydronics, Victaulic, Hays, or equal.

1.21 PRESSURE REDUCING VALVE:

Furnish and install a Bell & Gossett Model B7 pressure reducing valve or equal. The valve shall be installed in the fill line to the hydronic and steam systems. The valve shall have an anti-siphon check valve and a built-in strainer. Valve shall be adjustable from 8 to 25 psig, 3/4 inch size.

Pressure Reducing Valve shall be B&G, Taco or equal.

1.22 REDUCED PRESSURE BACKFLOW PREVENTER:

Furnish and install Watts Regulator Co. Series No. 009-S, 909-S or equal reduced pressure backflow preventer. Where shown, the backflow preventer shall be a complete assembly including tight-closing shut-off valves before and after the device and also be protected by a strainer. The design shall include test cocks and a pressure-differential relief valve located between two positive seating check valves.

The device shall meet the requirements of A.S.S.E. Standard 1013 and A.W.W.A. Standard C506. Unit vent outlet shall have a suitable connection for an air gap and shall be provided with an air gap fitting piped to a floor drain.

Reduced pressure backflow preventers shall be Watts, Hersey, Febco, Conbraco, Wilkins or equal.

1.23 TESTS:

General:

The Contractor shall furnish a competent individual familiar with the installation to assist the Balancing Company and make the necessary mechanical equipment adjustments as directed by the Balancing Company. The Contractor shall also furnish the necessary ladders, scaffolding, etc., needed for access to test and balance all systems.

The Contractor shall provide replacement pulleys, etc. as required to properly balance the heating equipment.

The following tests shall be performed on the respective systems. Tests shall be repeated until each system is proven acceptable.

Heating and Cooling:

The Contractor shall make an operating test of the heating and chilled water systems and all relating equipment.

At a time set by Contractor and agreed to by the Owner, the Contractor shall arrange to place the heating plant in operation and have available at that time representatives of the manufacturers of the equipment to assist in starting of the heating plant and to make necessary adjustment to equipment, and to prove satisfactory operation prior to turning over to the Owner.

The operating test shall cover a total running period of 24 hours and all pertinent data shall be presented to the Owner as an indication of the proper operation of the plant.

The Contractor shall cooperate with and assist the independent Testing and Balancing Company specified in Section 230800 - VENTILATION AND AIR CONDITIONING to properly balance the water flow to and from all coils and equipment and make any adjustments necessary to meet the required flows.

All piping systems installed by the Contractor shall be tested with a pressure equal to 150 percent of the normal operating pressure for the specific systems (100 psi minimum).

END OF SECTION 220600

SECTION 220700 – PLUMBING AND HEATING INSULATION AND PIPING IDENTIFICATION

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100, General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all labor, materials, fixtures, and equipment necessary to install complete piping, and equipment insulation as described herein and/or as shown on the Drawings. This includes all equipment and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.02 MATERIALS AND WORKMANSHIP:

All covering and insulating materials used on this project must contain the manufacturer's name on the containers. All materials must be dry and in good condition, free of defects, mildew, rough ends, etc. Insulation materials shall be Certainteed, Owens-Corning, Johns Manville, Armstrong, Knauf or equal.

All insulation work shall be performed by an Insulation Contractor who uses workers skilled in this type of work. Only first class workmanship will be acceptable. The Insulation Contractor shall submit shop drawings for all materials proposed to be installed in this project.

All pipe covering shall have a density of not less than 3-1/2 pounds per cubic foot.

All materials shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255, AND U.L. 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.03 PIPING AND VESSELS INSULATION:

All pipe covering shall be furnished with a factory-applied all service jacket. All-Service jacket shall have a polymer film exterior surface. All longitudinal joints shall be sealed with adhesive such as Benjamin Foster 30-35, or equal, or factory applied self-sealing laps. All end joints shall be sealed with 3 inches wide butt strips of material identical to pipe covering jackets, using adhesive or self-sealing jacket. No stapling will be permitted on any vapor-barrier jackets. No vapor-barrier work or self-sealing laps or lap work shall be installed when temperatures are below 40 degrees F.

Cover with 30 mil PVC cover in all exposed areas except mechanical rooms. PVC cover shall have solvent welded joints and seams. Piping 10 ft or greater above the floor need not have PVC covering.

Insulation shall be continuous through properly sized wall and floor sleeves with no joints within 12 inches of the penetration. Where a fitting is adjacent to the wall a continuous section of insulation must extend from the fitting to 12 inches beyond the other side of the wall.

Wrap pipe at penetrations of fire or smoke barriers with firestop pipe insulation, seal jacket seam and seal end joints to adjacent sections of insulation. Seal opening between insulation and pipe sleeve with firestopping material.

All plastic, fiberglass or other piping and fittings that are not rated for unprotected installation in return air plenums shall be wrapped with 3M Fire Barrier Plenum Wrap 5A+, or equal. The installation shall be in strict accordance with the manufacturer's written instructions. Wrap shall be a high temperature fiber blanket thermal insulation encapsulated in a fiberglass reinforced aluminum foil. Plenum wrap density shall be nominal 6 pcf and have a nominal ½ inch minimum thickness. The fiberglass blanket shall have a continuous use limit in excess of 1832 degrees F (1000 degrees C). Flame Spread Index and Smoke Developed Index of the foil encapsulated blanket shall be equal to or less than 25/50.

Alternatively, Johns Manville Micro-Lok HP, or equal fiberglass insulation which is UL listed and labeled to meet plenum flame and smoke spread ratings when installed over such plastic piping may be used to provide plenum protection. The installation and application shall be in strict accordance with the manufacturer's written instructions.

All piping exposed to outdoor weather conditions shall be additionally covered with 30 mil PVC jacket sealed watertight. PVC cover shall have solvent welded joints and seams.

All insulation installations shall conform to ASHRAE Standard 90.

1.04 FITTING AND EQUIPMENT INSULATION:

Insulate all fittings, valves, flanges and strainers with mitered segments of pipe insulation wired in place and premolded PVC plastic covers. Plastic covers shall be taped and sealed with a continuous vapor barrier on all cold systems. Plastic covers shall be Zeston or equal.

The Contractor shall allow for the removal and replacement of four (4) fitting or joint covers selected by the Architect/Engineer for inspection purposes. If any of the removed covers reveal unsatisfactory installation as determined by the Architect/Engineer, four (4) additional covers may be removed and replaced. Fitting covers may be removed and replaced four (4) at a time until the system installation is satisfactory.

For fittings where premolded PVC plastic covers are not available, coat each fitting with two 1/8 inch coats of an approved vapor-barrier mastic such as Childers CP-30 or equal. Reinforce each fitting by wrapping with glass fabric cloth extending 2 inches onto adjacent pipes and finish with additional coating of mastic worked into mesh of cloth to provide a smooth finish.

Coat vapor barrier penetrations, including insulation end butts, piping brackets, valve operator stems, etc., with two 1/8 inch coats of an approved vapor-barrier mastic. Trim the insulation at valve handle operators to allow for valve operation without damaging the vapor barrier. Insulation mastic for cold systems shall be Childer's CP-30 or equal for cold system vapor barriers. Vapor barrier shall be rated at 0.02 perms or less in accordance with ASTM E96 procedures.

Corner beads shall be used on all square corners.

Insulation shall be cut or mitered where necessary to fit the contour of the fittings and equipment. All voids shall be packed with light density glass fiber insulation. Insulation sections shall be

banded in place with 3/4 inch x 0.015 inch thick galvanized steel bands at 18 inch o.c. for all large equipment.

On all cold systems, insulation shall be impaled over welding pins at 12 inches o.c. and secured in place with speed washers. The 3/4 inch steel bands will not be required. Each layer of insulation shall have a vapor barrier cover to provide complete airtight envelope. Vapor-barrier shall consist of one layer of Ludflow foil barrier paper smoothly adhered to the insulation cement surface with vapor-barrier lap adhesive. Lap all joints a minimum of 3 inch and seal with vapor-barrier lap adhesive.

Apply 30 mil PVC cover over vapor barrier in all exposed areas except mechanical rooms. PVC cover shall have solvent welded joints and seams. Piping 10 ft or greater above the floor need not have PVC covering.

1.05 HOT PIPING AND VESSELS:

The following systems shall be insulated with the following minimum thicknesses of glass fiber insulation:

MINIMUM PIPE INSULATION – INTERNATIONAL ENERGY CONSERVATION CODE & ASHRAE 90.1
Based on thermal conductivity (k) of 0.23 btu-in./hour-ft^2-°F
on a flat surface at 75° F. mean

	Fluid Temp.	Insulation Thickness for Pipe Sizes					
Piping System Types	Range Deg.F.	1" & Under	1-1/4" to 1 1/2"	2”	2-1/2" to 4"	5 to 6"	8" & Over
Hot Water Heating Systems -							
Low Temp	120-200	1.0	1.0	1.5	1.5	1.5	2.0
Domestic Systems -							
HW, RHW	Any	1.0	1.0	1.01.5	1.5	1.5	

Do not insulate radiation runouts enclosed in radiation cover and risers between floor and radiation cover.

The following equipment shall be insulated with thicknesses as noted of calcium silicate blocks such as OCF, Kaylor or equal:

Heating System Air Separator . . 2"

Filter/Feeder…….2”

1.06 COLD PIPING AND VESSELS:

The following systems and services shall be insulated with the following thicknesses of glass fiber insulation including a factory-applied all service jacket and vapor barrier:

	Pipe Sizes	
	½” through 2”	2-1/2” to 12”

Domestic CW, downspouts, cooling coil drains	1/2"	1"

All rods for pipe hangers and metals having direct contact with cold water piping shall be insulated up to 8 inches and sealed same as fittings. Refer to Section 220100 for cold water pipe supports. Pipe hangers shall not be in direct contact with cold piping unless approved by the Architect/Engineer.

Pipe mounting brackets for cold piping shall be large enough to encompass the insulation. This piping shall be anchored securely at the point of connection to plumbing fixtures. The last mounting bracket adjacent to fixtures and equipment may clamp directly onto the pipe. A short length (18 inches maximum) of piping between the last bracket and the plumbing fixture is allowed without insulation.

Insulation thicknesses based on thermal conductivity (k) of 0.23 btu-in./hour-ft^2-°F on a flat surface at 75°F.

Insulation greater than 2 inch thickness shall be installed in layers with staggered joints.

1.07 PIPING IDENTIFICATION:

Identify all piping, insulated and uninsulated, except where concealed inside walls or below floors, with 1 inch high black letters designating the type of service and an arrow in the direction of flow. The lettering shall be applied after all painting of the piping is complete as specified in Division 9 - FINISHES. The lettering shall have an identifying word or phrase such as, cold water, gas, sprinkler, low pressure steam return, etc. Each pipe shall be identified in every room, at 30 feet intervals maximum and at each change in direction.

Identify all valves using a metal tag, except small isolating valves, that is, reheat coil shutoff valves, sink stops, radiator valves, etc., immediately adjacent to equipment served. The tags should tell the function of the valve or have a number relating to the function. If numbers are used and there is more than one of the same type valve, subnumbers may be used. For example, a tag labeled CW-2 would mean the second cold water valve on the system. Provide the Owner with two (2) copies of the master list showing the valve numbers, their location and what they control. Metal tags shall be 1-1/2 inch x 3 inch rectangular tags or 2 inch diameter circular tags.

To standardize the lettering and abbreviations, use the following listing:

Domestic Cold Water - (CW).

Hot Water - (HW).

Recirculating Hot Water (RHW).

Vent (Vent).

Waste (W).

Heating Water Supply (HWS).

Heating Water Return (HWR).

Sprinkler (SPR).

Gas (GAS).

1.08 EQUIPMENT IDENTIFICATION:

All pieces of mechanical equipment shall be identified with an identification name plate to match the name designated on the drawings. Names plates shall not be hand written and shall be permanently fixed to the piece of equipment.

END OF SECTION 220700

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DIVISION 23 – VENTILATION AND AIR CONDITIONING

SECTION 230100 - GENERAL PROVISIONS

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

This Section pertains to general provisions and requirements for construction of work specified in all sections of Division 23 herein.

"Contractor" referred to in this Section of the specification implies the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the mechanical installation specified in Division 23 and/or as shown on the Contract Drawings.

Where the specifications in subsequent Sections of Division 23 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring and incidentals necessary to be installed in accordance with manufacturer's recommendations except as otherwise approved.

1.02 PERMITS AND SERVICE CHARGES:

All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

All work shall be executed in accordance with all local, state and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.03 CODES AND STANDARDS:

All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.

1. Local and State Codes, Standards and Regulations.
2. National Fire Protection Association (NFPA).
3. National Electric Code (NEC).
4. Underwriter's Laboratory (UL).
5. American Gas Association (AGA) Standards.
6. Uniform Plumbing Code.
7. International Mechanical Code.
8. ASME Boiler and Pressure Vessel Codes.
9. State Boiler Safety Code.
10. American Water Works Association (AWWA).

11. National Sanitation Foundation (NSF).
12. Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).
13. International Building Code.
14. Life Safety Code.
15. State Energy Conservation Standards.
16. Americans with Disabilities Act (ADA).

All materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.04 COMPLIANCE:

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.05 DRAWINGS:

In general, the Drawings of the mechanical systems and equipment are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

Drawings of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

The Contractor, Subcontractor's and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others.

Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS:

The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least ten days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

1.07 SHOP DRAWINGS:

Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors.

To the extent practical, complete sets of shop drawings for each specification section shall be submitted. In the case that a particular item is required to be expedited, that particular item may be submitted individually.

Submit shop drawings in PDF format.

Furnish Shop Drawings as follows:

1. For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.
2. For all equipment, systems or devices where Shop Drawings are specifically called for.
3. For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.

The Contractor shall check all Shop Drawing submittals for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so

note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.

Shop Drawings will be reviewed by the Architect/Engineer, and copies of Shop Drawings will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.

Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages as may be incurred to the structure as a result of the above correction shall be paid by this Contractor.

Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.

1.08 CLEANING:

The Contractor and/or Subcontractors for the various phases of the work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished under any or all contracts in a clean first class condition.

Permanent heating and ventilating systems shall not be used during the construction period unless the project site is in a clean and dust free condition and shall be subject to the approval of the Architect/Engineer and Owner.

Surfaces of all coils, fan housings, fan wheels, fan motors, air unit plenums, all air filters, and mechanical equipment shall be wiped clean or washed if required, leaving the installation in a first class condition. All throwaway filters used during construction shall be replaced.

The surfaces of all equipment shall be cleaned, and each item shall be left in a first class condition.

1.09 PAINTING:

Painting of materials and equipment furnished under the mechanical portion of the contract shall be as described in Division 9 - FINISHES. Contractor shall refinish and restore to the original condition and appearance, all mechanical equipment which has sustained damage to the manufacturer's prime and finish coats of enamel or paint. Materials and workmanship shall be equal to the requirements described in Division 9 - FINISHES.

1.10 RECORD DRAWINGS:

The Contractor shall keep a complete set of all mechanical drawings in the jobsite office for purpose of showing the installation of mechanical systems and equipment. This set of drawings shall be used for no other purpose. Where any materials equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall be clearly and neatly shown on this set of drawings using ink or indelible pencil. At the

completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property.

1.11 OPERATING INSTRUCTIONS:

The Contractor shall furnish the Owner two (2) sets of complete catalog data, manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division. All such literature shall be bound in an amply sized three-ring binder and submitted to the Architect/Engineer for approval and for eventual transmittal to the Owner. The manual shall have a Table of Contents at the front of the manual. Before producing hard copies of the manuals, verify with the General Contractor if electronic or hard copy versions of the manuals are to be submitted.

The Contractor shall also supervise the initial operation of all equipment and instruct the operator selected by the Owner in such operation as required to acquaint him thoroughly with the equipment.

1.12 DELIVERY AND STORAGE OF MATERIALS:

Make provisions for delivery and safe storage of materials on the jobsite and make arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered at such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected. All stored equipment shall be protected from the weather conditions and construction debris with a protective covering securely tied in place.

1.13 MECHANICAL PROVISIONS:

Mechanical equipment shall operate without objectionable noise or vibration, as determined by the Architect/Engineer. If such noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, ducts, or other parts of the mechanical work, make necessary changes and additions, as approved, without extra cost to Owner.

Provide oil level gauges, grease cups and grease gun fittings for machinery bearings as recommended by the manufacturer. Extend oil or grease fittings by copper tubing to readily accessible locations.

1.14 CONCRETE BASES:

Concrete bases are required for floor mounted mechanical equipment inside buildings and are specified in Division 3 - CONCRETE. After bases are poured they shall set at least seven (7) days before mounting equipment. The Contractor shall coordinate the setting of expansion bolts in the bases for attachment of equipment and/or isolators.

This Contractor shall verify and coordinate the exact location of the bases and the exact size requirements for specific items of equipment.

As applicable, indoor chillers, condensers, air handling units, fans and other floor mounted mechanical equipment shall be mounted on four inch (or as required) high concrete bases.

1.15 COORDINATION OF WORK:

The Contractor shall process shop drawings and order equipment and materials expeditiously after receiving the Contract and the mechanical installation shall be substantially complete when the general construction work is completed. This Contractor shall confer and cooperate with all other Contractors on this project and shall arrange his work in proper relation to the work of others. Each Contractor shall furnish, install, and maintain in place all anchors, inserts, sleeves, etc., required for his work. Each Contractor will also be held solely responsible for proper size and location of all anchors, inserts, sleeves, chases, recesses, openings, bases, etc., required for proper installation of his work. All cutting and patching made necessary by failure or neglect to coordinate with other Contractors shall be the responsibility of this Contractor. Any cutting or patching shall be subject to the direction and approval of the Architect/Engineer and all damage due to cutting or patching shall be repaired by this Contractor.

After being instructed by this Contractor to do so, the General Contractor will leave all openings in roof, walls, floors, etc., for the passage of ducts, etc. The General Contractor shall also provide concrete bases and roof curbs where shown for mounting the mechanical equipment unless specified otherwise. This Contractor shall verify the exact size and location required for installation of his equipment with the General Contractor.

In general, the Division 26 – Electrical Contractor will provide all power wiring and make one power connection to each item of mechanical equipment, as outlined under Electrical Section.

1.16 GUARANTEE:

Refer to the requirements of the General Conditions of the Contract for Construction (AIA Document A201), Section 3.5.

All mechanical equipment including equipment used during construction for temporary purposes shall be guaranteed for a period of one year after the time of final acceptance of this work and shall be in like new condition at time of final acceptance.

1.17 TEMPORARY HEATING AND COOLING:

The building heating, ventilation, and air conditioning systems shall not be used for temporary heating, ventilating, or cooling purposes without written approval of the Architect/Engineer.

Use of the building permanent heating, ventilating, and air conditioning systems prior to substantial completion is subject to the written approval of the Architect/Engineer and extended warranties shall be provided at no additional cost.

Duct systems shall not be used during construction without the written approval of the Architect/Engineer. Systems used during construction without written approval, may be required to be professional cleaned or replaced at no cost, as determined by the Architect/Engineer.

Typically, spaces must be completely free from significant dust and dusty construction procedures before approval to utilize the permanent systems will be granted. The Contractor shall provide for temporary heating, ventilating, air conditioning, or dehumidifying systems as needed.

1.18 ELECTRICAL:

Electric Motors:

All electric motor driven equipment being furnished and installed under Division 23 of these specifications shall be complete with electric motors, unless specified otherwise.

All electric motors shall be as manufactured by Westinghouse, Century, Wagner, Allis Chalmers, Reliance, General Electric, or equal. Bearings shall be ball type with alemite lubricating fittings extended to an easily accessible location for field servicing. Minimum service factors for all motors shall be 1.15. All motors shall conform to applicable NEMA standards and all motors specified for use in hazardous locations shall bear the stamp of approval of the Underwriter's Laboratories. All motors, except direct connected motors, shall be furnished complete with cast iron or stamped steel adjustable slide rails. Single phase motors shall be capacitor start type, drip proof, unless specified otherwise. All motors shall be single speed and shall operate at 1,750 RPM, unless specified otherwise.

Horsepower Rating: All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 120 percent of the driven unit brake horsepower requirements.

Single Phase Motors: Unless specifically noted otherwise, all electric motors shall be designed for operation in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current. Motors shall be thermally protected.

Three Phase Motors: All electric motors shall be designed for operating in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current.

All motors less than 3/4 horsepower shall be 115 volt, single phase unless designated otherwise and all motors 3/4 horsepower and larger shall be as specified in the specific section or as noted on the Drawings.

Premium Efficiency Motors:

Premium efficiency motors shall be furnished on all mechanical equipment where 1 horsepower or larger motors are required.

Motors shall be designed with special stator steel for reduced core losses. Windings shall be oversized copper placed for maximum efficiency. Stator and rotor shall be extra long to reduce flux losses. Frame shall be ODP (unless specified otherwise) of cast iron or cast aluminum construction.

Motors shall be squirrel cage, horizontal base mount, ball bearing, NEMA B design, Class B design, Class B insulation, continuous duty, 1.15 SF, 40 degrees C. ambient.

Minimum nominal full load motor efficiencies shall be based on ASHRAE Standard 90.1 (latest edition).

Furnish and install Aegis SGR, or equal, maintenance free, circumferential, conductive micro

fiber shaft grounding rings on all AC motors controlled by adjustable frequency drives to discharge shaft currents to ground.

Motors shall be similar to Louis Allis "Spartan" Series, Gould "E-Plus" Series, or Westinghouse "MAC II" Series. Manufacturer shall furnish proof of efficiency rating.

Motor Starters:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 23 of these specifications, all motor starters will be furnished and installed under Division 26, ELECTRICAL.

Electrical Wiring:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 23, all electric power wiring shall be furnished and installed in Division 26, ELECTRICAL. The Electrical Contractor will make one power connection to each item of mechanical equipment, unless specified otherwise.

Electrical wiring furnished and installed under these specifications shall conform to all applicable requirements of Division 26, ELECTRICAL.

Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in accordance with the following schedule:

Item		Division Furnished Under	Set in Place or Mounted Under	Division Wired & Connected Under
	Equipment Motors	23	23	26
	Magnetic Motor Starters:			
	Automatically controlled, with or without HOA switches	26	26	26
	Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	23	23	26
	Manually controlled	26	26	26

Manually controlled and furnished as part of factory wired equipment	23	23	26
Line voltage thermostats, time clocks, etc., not connected to control panel systems	23	26	26
Electric thermostats, time clocks, remote bulb thermostats, float controls, etc., which are an integral part or directly attached to ducts, etc.	23	23	23
Temperature control panels and time switches mounted on temperature control panels	23	23	23
Damper motors, solenoid valves, EP and PE switches, etc.	23	23	23
Smoke damper operators	23	23	23
Alarm bells	23	23	23
Control circuit feeders	26	26	26
Low voltage controls, thermostats, valves, dampers, etc.	23	23	23
Fire and smoke detectors, including relays for fan shutdown	26	26	26(1)
Pushbutton stations, pilot lights	26	26	26
Heat tape	26	26	26

Disconnect switches, thermal overload switches, manual operating switches	26	26	26
Multi-speed switches	23	26	26
Contactors	26	26	26
Control relays, transformers	23	26	26

NOTES:

(1) Wiring from alarm contacts to alarm system shall be by the Division 26 Contractor; control function wiring shall be by the Division 23 Contractor.

All control wiring and controls as noted on the Drawings and/or as specified in these specifications shall be provided by this Contractor, including items set in place and wired and connected by the Division 26 Contractor, unless specifically shown otherwise on the Drawings.

1.19 SLEEVES:

Any pipe passing through building construction including walls, floors, roofs or masonry partitions or as noted on the Drawings shall be encompassed with sleeves in accordance with the following:

All pipe sleeves through slabs, floors, masonry walls and masonry partitions shall be 1/2 inch greater in inside diameter than the external diameter of pipe passing through. Sleeves for insulated piping shall be large enough to accommodate the insulation without harming the insulation or vapor barrier. All sleeves shall be fabricated from new material cut square and reamed.

Sleeves shall be provided in all masonry partition walls including locations above suspended ceilings where masonry partition walls extend from floor slab to slab above. Sleeves shall be Schedule 40 steel pipe finishing flush with the wall surface.

Sleeves through exterior building walls shall be Schedule 40 steel pipe with welded flange in the middle of the sleeve and ends finishing flush with finished surfaces. Space between pipe and sleeve shall be packed to provide a watertight joint.

Sleeves through roof slabs and floor slabs in concealed locations shall be No. 22 gauge galvanized steel or crete sleeves (linear polyethylene). Concealed sleeves shall be considered as pipe sleeves in shafts, pipe chases and within walls and partitions.

Sleeves through floor slabs in exposed areas shall be Schedule 40 steel pipe and sleeves shall extend 1/4 inch above the finished floor surface. For slabs in equipment rooms and in other wet areas, sleeves shall be Schedule 40 steel pipe and shall extend 2 inches above finished floor surface.

Floor sleeves in membraned floors shall be furnished with flashing rings and clamps.

All sleeves in exposed locations, except equipment rooms, shall be set so plates specified will cover the sleeves.

All pipe sleeves where wet conditions exist, except sleeves through exterior walls, shall be caulked with a plastic caulking, including sleeves in concealed locations. The space between the pipe and the sleeves shall be packed with oakum and approximately 1/2 inch depth of a polyisobutylene
sealer shall be packed or caulked in both ends of sleeve, even with the ends of the sleeve. The sealer shall be suitable for temperatures from minus 50 degrees to 300 degrees, suitable for painting, non-corrosive and have good adhesion.

Sleeves in fire rated construction, equipment rooms, and/or where designated on the Drawings shall consist of 22 gauge galvanized sheet steel with lock seam joints. Seal sleeves with a fire retardant sealant. When applied according to manufacturer's recommendations, sealant shall have a 3-hour U.L. fire rating.

All sleeves required to provide the proper openings in masonry construction for the passage of ductwork, mechanical equipment, etc., shall be furnished and installed by this Contractor. These sleeves shall also be removed by this Contractor after the opening has been formed. The opening around all ductwork, equipment, etc., passing through slabs, floors, walls and partitions shall be sealed as specified above for piping. Fire/smoke dampers shall be installed in accordance with the manufacturer’s installation instructions.

All sleeves shall be set and maintained in place by this Contractor during the progress of the work. This Contractor shall be responsible for locating all sleeves at the proper location.

Sleeves are not required for core drilled masonry wall and floor holes, masonry wall and floor holes formed by polyethylene plastic (removable) sleeves, or for masonry holes made in another neat manner except in equipment rooms and other wet areas.

Sleeves are not required in metal or wood stud wall construction. Rated systems shall be provided as required to provide the necessary rating of the penetration.

Interior wall sleeves are only required on cold insulated piping (refrigerant suction piping, etc.). All other steel or cast iron piping 4 inches and smaller shall be grouted directly into the wall as necessary to provide the required fire and smoke rating. Piping larger than 4 inch size and all non-rated piping shall be provided with a rated system.

Firestopping materials shall be 3M, Hilti, MetaCaulk, Nelson or equal.

1.20 FIRESTOPPING:

Refer to the requirements of Section 072700 - FIRESTOPPING.

1.21 WALL, FLOOR AND CEILING PLATES:

Furnish and install chrome-plated wall, floor and ceiling plates on all exposed pipes where they pass through walls, floors, or ceilings in finished areas. Finished areas shall be those areas which are painted or have special finishes within the room. The wall plates shall be a minimum of 3/32 inch thickness and shall have set screws or spring locks for clamping to the piping. The plates shall be chrome-plated steel, cast iron or brass and shall set tight against the wall.

1.22 EQUIPMENT SUPPORT:

Furnish and install all necessary wall backing, brackets, braces, plates, angles, wall hangers, etc., required for properly supporting mechanical equipment and mechanical appurtenances. All supports shall be securely anchored with lead inserts, expansion shields, through-going bolts, lag screws or other devices as required.

All items of mechanical equipment hung from overhead structure shall be hung from 2-1/2 inches by 2-1/2 inches by 3/16 inch angles minimum which shall span at least 3 members, unless noted otherwise.

1.23 EXISTING SERVICES:

The Contractor shall verify the exact location of all existing building services extended and/or relocated for this project. The Contractor shall also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

All active services which are encountered shall be protected, braced and supported where required for proper execution of the work and without interruption of the service if possible.

All inactive services which are encountered shall be protected or removed as directed by the Architect/Engineer, Owner, Utility Company or Municipal Agency having jurisdiction. The service shall also be plugged or capped as directed.

When active services must be temporarily interrupted, the interruption shall be scheduled at night or at such time as approved by the Owner or authority having jurisdiction and so as to cause the minimum of interference with establishing operating routine. Arrangements shall be made to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

1.24 EXCAVATION:

Trenching and excavation for all underground piping and equipment shall be excavated to the required depths. The bottom of the excavation shall be tamped hard and graded to secure the required fill. Rock, where encountered, shall be excavated to a depth of 6 inches below the bottom of duct or pipe and before duct or pipe is laid, the space between bottom of pipe and rock surface shall be filled with gravel.
After the installation has been tested, inspected and approved by the Architect/Engineer and prior to backfilling, the forms shall be removed and the excavation shall be cleaned of trash and debris. Materials for backfilling shall consist of the excavation, or borrow of sand or gravel, and shall be free of trash, lumber, or other debris. Backfill shall be placed in horizontal layers, not exceeding 9 inches in thickness, and properly moistened. Backfill inside the building and under any exterior slabs or other paved areas shall be compacted by hand or mechanical means to the density of 95 percent Proctor and areas outside the building not covered by concrete slabs or other structures or

pavement shall be compacted to the density of the adjacent undisturbed soil. Any settling within the one (1) year guarantee period shall be repaired at no cost to the Owner.

1.25 ACCESS TO EQUIPMENT:

Access shall be provided to all motors, valves, dampers, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The location of the access openings relative to the mechanical equipment shall be coordinated to assure proper access to the equipment. The door shall maintain any ratings of the wall, ceiling, etc. that it penetrates.

Access openings are required for valves, manual, motorized, fire, and smoke dampers and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, walls, ceilings, etc., under this portion of the Contract.

1.26 PROTECTIVE DEVICES:

All sheaves, belts, drives, couplings, and moving parts shall be protected by approved permanent guards, shields, or railings, which shall be in place whenever the equipment is in operation and shall be in accordance with applicable safety standards.

All pressure and/or temperature relief valves shall have the discharge piped full size to within 6 inches of the floor or floor drain. The piping shall be securely anchored. All relief valves shall be ASME approved and proper size for the application.

1.27 PIPING CONNECTIONS:

Furnish and install unions or mating flanges at all connections to each piece of equipment, conveniently located to facilitate quick and easy disconnecting of equipment for replacement, tube cleaning or general maintenance. Flanged or union connections shall be used on both sides of equipment. Unions or flanges shall be of the same material or finish as the piping systems in which they are installed. Unions are not required for grooved pipe systems.

1.28 FLEXIBLE CONNECTORS:

Furnish and install flexible connectors on all piping connections to rotating equipment such as compressors, condensing units, etc., and where shown on the Drawings. Flexible connectors shall also be installed at all locations where necessary to prevent damaging stresses to piping, equipment, or building structure, and where necessary to isolate noise at its source.

Flexible connectors for refrigerant piping shall be close pitch annular corrugated phosphor bronze hose and bronze braid for refrigerant piping and non-ferrous piping systems, Flexonics Type PCB or equal.

Flexible connectors shall be installed in strict accordance with manufacturer's recommendations and shall be constructed of material specified herein, unless recommended otherwise by the manufacturer for specific applications. All piping shall be anchored to prevent elongation or compression of the flexible connectors.

Flexible Connectors shall be Kinetics, Proco, Mercer, Flexonics, Twin City Hose, Inc. or equal.

1.29 PIPE HANGERS, SUPPORTS AND ANCHORS:

Anchors as shown and detailed on the Drawings and specified herein and/or as required. All support components shall conform to Manufacturer's Standardization Society Specification SP-58. The hangers shall adequately support the piping system. They shall be located near or at changes in piping direction and at concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping. On other than vapor barrier insulated lines, hangers shall bear directly on piping.

Hangers shall be constructed of malleable or wrought iron unless noted otherwise, and hangers supporting copper pipe shall be copper plated. Hangers for pipe 3 inches and smaller shall be band and socket Michigan Model No. 100 or equal. For piping over 3 inches, hangers shall be adjustable, Clevis type, Michigan Model No. 400 or equal.

Where groups of three or more pipes occur, they may be supported with trapeze hangers using two hangers as specified with a capped pipe cross member.

Where clearance between pipe and overhead support is insufficient for the use of other hangers specified, use Michigan Model No. 605 or equal.

Horizontal steel piping shall be supported as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4 inch	3/8 inch	8 feet
1-1/2 inch & 2 inch	3/8 inch	10 feet
2-1/2 inch & 3-1/2 inch	1/2 inch	15 feet
4 inch & 5 inch	5/8 inch	15 feet
6 inch	3/4 inch	17 feet
8 inch through 12 inch	7/8 inch	22 feet

Horizontal copper piping shall be supported as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1 inch	3/8 inch	6 feet
1-1/4 inch & 1-1/2 inch	3/8 inch	8 feet
2 inch	3/8 inch	9 feet
2-1/2 inch	1/2 inch	9 feet
3 inch & 4 inch	1/2 inch	10 feet

For vertical piping, where supports are not indicated on the Drawings, support steel and copper pipe at every other floor.

Pipe hangers shall not be attached to the roof deck. Hangers shall be attached to the structure with beam clamps, beam attachment and brackets bolted to joists and beams. Use Michigan Model No. 340 or equal, steel washer plates for pipe supported from steel joist. The Contractor shall endeavor to hang near joist panel joints wherever possible.

Pipe hangers for cold piping, refrigerant suction piping and all insulated piping on trapeze hangers shall be large enough to encompass the insulation, using a metal shield so the vapor barrier jacket will not be broken. See Insulation Section.

Pipe mounting brackets for cold piping shall be large enough to encompass the insulation B-Line Model B2417 or equal. This piping shall be anchored securely at the point of connection to equipment. The last mounting bracket adjacent to equipment may clamp directly onto the pipe. A short length (18 inches maximum) of piping between the last bracket and the connection is allowed without insulation.

Hanging from one pipe to another is prohibited.

Pipe Hangers shall be Michigan, Grinnell, PHD, B-Line or equal.

1.30 PIPING INSTALLATION:

All pipes shall be round and straight, of required size. Cutting shall be done with proper tools and pipes shall be reamed to full size after cutting.

Piping shall be properly enclosed, supported, guided, anchored, sway braced, connected, tested, cleaned and flushed out and shall be properly insulated and protected where required.

All pipes shall be run with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of the Architect/Engineer. Lines required to be enclosed in ceiling, chaseways or similar spaces shall be installed to permit such enclosure as intended. All pipe runs shall be carefully laid out and scheduled to avoid necessary interferences with other work. Pipe sizes shown on the Drawings are nominal pipe sizes and not outside diameters.

Pipes shall be run substantially as indicated on the Drawings. However, the Architect/Engineer reserves the right to require this Contractor to make changes in pipe locations where conflicts occur with other trades. Such changes shall be made without extra cost to the Owner.

Piping shall be installed with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Such provision shall be made by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Suitable anchors and guides shall be provided to permit proper deflection and compression of offset loops and expansion joints. Expansion joints shall not be used in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the Drawings or where otherwise obviously necessary.

Exposed piping shall be installed in a sanitary manner for ease in cleaning. Equipment piping shall also include wastes and drains which are safe-wasted without a direct connection.

Minimum grade for horizontal drainage piping shall be 1/4 inch per foot for 3 inch diameter piping or less, 1/8 inch per foot for 4 inch and 6 inch diameter piping and 1/16 inch per foot for drainage piping over 6 inch diameter.

END OF SECTION 230100

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SECTION 230700 - INSULATION AND PIPING IDENTIFICATION

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 230100, General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all labor, materials, fixtures, and equipment necessary to install complete piping, ductwork, and equipment insulation as described herein and/or as shown on the Drawings. This includes all equipment and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.02 MATERIALS AND WORKMANSHIP:

All covering and insulating materials used on this project must contain the manufacturer's name on the containers. All materials must be dry and in good condition, free of defects, mildew, rough ends, etc. Insulation materials shall be Anco, Certainteed, Owens-Corning, Johns Manville, Armstrong, Knauf or equal.

All insulation work shall be performed by an Insulation Contractor who uses workers skilled in this type of work. Only first class workmanship will be acceptable. The Insulation Contractor shall submit shop drawings for all materials proposed to be installed in this project.

All pipe covering shall have a density of not less than 3-1/2 pounds per cubic foot.

All materials shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255, AND U.L. 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.03 EQUIPMENT INSULATION:

Insulation shall be cut or mitered where necessary to fit the contour of the fittings and equipment. All voids shall be packed with light density glass fiber insulation. Insulation sections shall be banded in place with 3/4 inch x 0.015 inch thick galvanized steel bands at 18 inch o.c. for all large equipment. Insulation shall be covered with one inch galvanized hexagonal wire mesh. Apply 1/2 inch of insulating cement such as OC-110 or equal in 2 layers over the wire mesh.

Cover with 30 mil PVC cover in all exposed areas except mechanical rooms. PVC cover shall have solvent welded joints and seams. Piping 10 ft or greater above the floor need not have PVC covering.

On all cold systems, insulation shall be impaled over welding pins at 12 inches o.c. and secured in place with speed washers. The 3/4 inch steel bands will not be required. Each layer of insulation shall have a vapor barrier cover to provide complete airtight envelope. Vapor-barrier shall consist of one layer of Ludflow foil barrier paper smoothly adhered to the insulation cement surface with vapor-barrier lap adhesive. Lap all joints a minimum of 3 inch and seal with vapor-barrier lap adhesive.

1.04 HOT PIPING AND VESSELS:

The following equipment shall be insulated with thicknesses as noted of calcium silicate blocks such as OCF, Kaylor or equal:

Breeching . . . . . 2"

Boiler breeching insulation may be high temperature insulating blanket suitable for temperatures up to 1200ºF. Apply a 22 gauge aluminum cover on the boiler breeching insulation.

1.05 COLD PIPING AND VESSELS:

Refer to Section 230100 for cold pipe supports. Pipe hangers shall not be in direct contact with cold piping unless approved by the Architect/Engineer.

All piping exposed to outdoor weather conditions shall be additionally covered with 30 mil PVC jacket sealed watertight. PVC cover shall have solvent welded joints and seams.

Pipe mounting brackets for cold piping shall be large enough to encompass the insulation.

1.06 DUCT INSULATION - EXTERNAL:

All exhaust and relief ductwork routed through cold spaces, and all outdoor air ductwork and combustion air ductwork shall be insulated with 1-1/2 inches of external insulation. All round supply air ductwork, except exposed round ductwork in conditioned spaces, shall be insulated with 1 inch of external insulation.

In ducted return systems where ceiling cavities are not return air plenum spaces, externally insulate duct mounted or VAV box mounted reheat coil casings and exposed tubes to prevent condensation.

Externally insulate portions of fire, smoke, and combination fire and smoke dampers and sleeves which do not have interior duct insulation.

Insulate all drip pans and ducts through the roof or sidewalls with 1 ½ inches of external insulation. All ducts through the roof or sidewalls shall be insulated for a minimum distance of 4'0" laterally from the opening. This shall apply to all relief and exhaust air openings.

External duct insulation in exposed locations shall be 3 pound density Owens-Corning Fiberglass FSK rigid board insulation for cold equipment down to minus 60 degrees F., or equal. Insulation shall be cut to fit between standing seams and stiffeners and shall be secured to ductwork by impaling over pins located not more than 12 inches o.c. or more pins if necessary to provide a tight fit to the ductwork. All joints shall be tightly butted and taped. Cover all pin penetrations and all joints with OCF joint sealing tape or equal. Take special care in applying the tape to prevent dust from fouling the tape. The complete installation of external duct insulation shall follow the instructions of the manufacturer of the insulation used. Complete system shall be U.L. rated and meet NFPA Fire Hazard Classification.

External duct insulation in concealed locations shall be 1 pound density Owens-Corning Fiberglass Faced Duct Wrap Series ED 100 FRK-25, or equal. Insulation shall be wrapped

tightly on the duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. Adhere insulation to metal with 4 inch strips of insulation bonding adhesive at 8 inch o.c. Additionally secure insulation to the bottom of rectangular duct work over 24 inches wide with mechanical joints, the 2 inch flange of the facing shall be secured using 9/16 inch flare-door staples applied 6 inches o.c. and taped with minimum of 3 inch wide foil reinforced kraft tape. On longitudinal joints, the overlap shall be secured using 9/16 inch flare-door staples applied 6 inch o.c. and taped with minimum 3 inch wide foil reinforced kraft tape. All pin penetrations or punctures in facing shall also be taped.

Wrap duct at penetrations of fire or smoke barriers with firestop insulation, seal jacket seam and seal end joints to adjacent sections of insulation. Seal opening between insulation and sleeve with firestopping material.

1.07 DUCT INSULATION - INTERNAL:

All rectangular supply and return ductwork shall be insulated with 1 inch of internal insulation.

Internal duct insulation shall be Owens-Corning Fiberglass Duct Liner or equal, 1-1/2 pound density, and have a thermal conductivity of 0.28 at 75 degrees F. mean temperature. The surface shall be coated with a black fire-resistant neoprene coating meeting NFPA 90A Standards and shall have no air erosion of the fibers with air velocities up to 6,000 fpm. Increase duct size to accommodate liner. Adhere liner, with coated side towards air stream, to all interim sides of duct with 100 percent coverage of fire resistant insulation bonding adhesive such as Benjamin Foster No. 81-20, 3M spray adhesive No. 77, or equal. When duct width or height exceeds 20 inches for horizontal ducts and 12 inches for vertical ducts, further secure the liner to these surfaces with mechanical fasteners at 15 inch o.c. Top pieces shall be supported by the side pieces. All edges and joints shall be coated with adhesive.

Velocities - 2,000-4,000 fpm: For all ducts exceeding 16 inches in height and 12 inches width, further secure the liner to these surfaces with mechanical fasteners at 15 inch O.C. The dimensions shall be reduced to 12 inches for vertical ducts.

Velocities - 4,000-6,000 fpm: Install as above except that mechanical fasteners shall be spaced 12 inches o.c. on all surfaces and metal noising shall be installed to secure liner at all upstream traverse edges.

1.08 PIPING IDENTIFICATION:

Identify all piping, insulated and uninsulated, except where concealed inside walls or below floors, with 1 inch high black letters designating the type of service and an arrow in the direction of flow. The lettering shall be applied after all painting of the piping is complete as specified in Division 9 - FINISHES. The lettering shall have an identifying word or phrase such as, cold water, gas, sprinkler, low pressure steam return, etc. Each pipe shall be identified in every room, at 30 feet intervals maximum and at each change in direction.

To standardize the lettering and abbreviations, use the following listing:

Refrigerant (R-XXX).

1.09 EQUIPMENT IDENTIFICATION:

All pieces of mechanical equipment shall be identified with an identification name plate to match the name designated on the drawings. Names plates shall not be hand written and shall be permanently fixed to the piece of equipment.

END OF SECTION 230700

SECTION 230800 - VENTILATION AND AIR CONDITIONING

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 230100 General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete ventilation and air conditioning systems as described herein and/or as shown on the Drawings. This includes all ductwork, equipment, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

See Section 230700 for insulation requirements.

1.02 DUCTWORK:

All ductwork is to be galvanized iron fabricated and erected in a workmanlike manner. Fabricate plenums and special fittings, as shown on the Drawings, or as required. Access doors to plenums shall be double wall construction with heavy hardware. All ductwork shall be of the gauges hereinafter specified and constructed to the best grade Inland, U.S. Steel, United Sheet Metal or equal brands, with G90 galvanization.

Metal gauges for low and medium pressure duct systems shall be of metal gauges and reinforcing as recommended by SMACNA or as follows:

Maximum Dimension of Rectangular Ducts or Diameter of Round Low Pressure Ducts	Galvanized Sheet Steel Gauge Number
Up thru 12"	26
Over 12" thru 30"	24
Over 30" thru 54"	22
Over 54" thru 84"	20
Over 84"	18

Maximum Dimension of Rectangular Ducts or Diameter of Round Medium Pressure Ducts	Galvanized Sheet Steel Gauge Number
Up thru 18"	24
Over 19" thru 48"	22
Over 49" thru 72"	20
Over 73" thru 96"	18

Ductwork shall be constructed, braced, reinforced and sealed as recommended by ASHRAE and SMACNA. Environmental air ductwork as defined by the International Mechanical Code shall be substantially airtight. Low pressure ductwork shall be suitable for pressures up to 2 inch w.g. Medium pressure ductwork shall be suitable for pressures up to 3 inch w.g. All ductwork 18 inches and greater in width shall be cross-broken. See SMACNA requirements for proper sealing of ductwork. All supply air ductwork between VAV air handling units and VAV terminals shall be medium pressure construction.

Non-proprietary T-24, proprietary TDC/TDF flanges and Ductmate 35/25 may be used for transverse joint construction where the longest side is 35 inches or smaller. Ductwork with the longest side 36 inches and over shall be constructed using Ductmate 35/25 or equal slide on systems, per Ductmate Industries Installation Procedures and Duct Construction Standards, latest edition. The non-proprietary SMACNA T-22 Flanged Connection may be used as defined on Page 1.63, 1.64 and 1.80, of the 1995 SMACNA Manual, Second Edition. Ductmate 440 Butyl Gasket, or equal, shall be used between all rectangular transverse flanged duct connections, Ductmate's 440 Butyl Gasket, shall be used with the Ductmate Systems. For rectangular ductwork located outdoors, exposed to weather, construct ductwork per, "Transverse Joints Rectangular" with a continuous metal cleat on top joints of ducts for added weather protection. Slide on systems shall be Ductmate, Ward Industries, Inc., or equal.

No obstruction shall be permitted in the ductwork to retard the flow of air. If it is necessary to run a pipe or conduit through a duct, the duct size shall be increased to compensate for the obstruction.

Where space permits, duct turns shall be constructed with an inside radius equal to or greater than the duct width or duct turn vanes may be used. Where space does not permit duct turns as described above, duct turn vanes shall be used. Where space permits, duct offsets 30 degrees and greater shall be constructed with an inside radius equal to or greater than the duct width.

Where interior duct insulation is required, increase the duct size to maintain the free area shown on the Drawings.

Provide exterior insulated drip pans, 3 inches deep, under or adjacent to all roof and wall openings including but not limited to under all intake or relief hoods and louvers. Drip pans to be soldered watertight.

Power operated dampers not furnished as a component of the ventilating machines will be furnished under the Temperature Control Specifications. They shall be installed in the ductwork under this specification. Caulk around all sides of high efficiency damper frames.

Flexible connections shall be installed between suction and discharge openings in fan units and the ducts with which they are connected to prevent transmission of vibration noises. Material shall be watertight and fire retardant canvas weighing not less than 20 ounces per square yard, or shall be glass fabric on high temperature systems where fire hazard exists. Both materials shall be approved by Underwriter's Laboratories. The flexible material shall be furnished with all necessary angles, bolts, clips or other fasteners. Flexible connections are not required on fan units with internal fan isolation, such as Air Handling Units or Power Roof Ventilators. Fan Powered VAVs and Fan Coil Units shall have flexible connections at the supply discharge duct. They shall have flexible connections at the return inlet duct if ducted to a return grille.

Furnish and install access panels in the ductwork adjacent to all motorized dampers, fire dampers, louvers, reheat coils, and equipment which may require servicing or cleaning. Panels shall be tight fitting and shall be located so as to make them easily accessible. All panels installed in insulated ductwork shall be double wall, insulated type. Panels shall be Ruskin, Air Balance, Ventlok, ADCO, or equal.

Dynamic rated fire dampers shall have an 18 inch square access panel or an 18 inch long removable duct section shall be installed adjacent to dynamic rated fire dampers in addition to a smaller inspection access panel. The removable section shall be assembled using Ductmate or equal duct joints. The joint at the damper shall be assembled with plastic fastener clips. Ductwork 24 inches and wider shall have an 18 inch by 18 inch access door in lieu of removable section.

Ductwork installed above UL fire rated ceiling assemblies shall be installed in strict accordance with the provisions required by the UL Design Number designated in the Underwriters Laboratories Fire Resistance Directory.

All ductwork visible through the face of a register or grille shall be painted with a flat black paint.

All rigid and flexible ductwork materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

Concealed low pressure round ductwork may be rigid spiral ductwork or snaplock type with adjustable elbows.

All exposed round ductwork and round ductwork to the inlet of VAV terminals shall be United, Semco, Norlock, Foremost, SMC, SPOT or equal, rigid spiral duct and fittings. Tee fittings shall be factory built tee fittings or equal. Saddle branch takeoff fittings are not acceptable except as approved by the Architect/Engineer.

Round ductwork shall be supported at 6 feet o.c. where building framing does not provide such support. Support shall be minimum 3/4 inch metal strap suspended from the roof or framing.

Flexible duct shall not exceed 8 feet in length or pass through walls. Flexible round ductwork may only be used for final connections to supply registers and diffusers in concealed locations.

All round sheet metal supply air ductwork, except exposed, shall be insulated with 1 inch thick of Owens-Corning Fiberglass Faced Duct Wrap Series ED-100 FRK-25 or equal.

1.03 UNDERGROUND DUCTWORK:

Provide a complete underground duct system (including: plenums, round duct, run-outs, diffuser boots, etc.) must be from one manufacturer and be of the same material, construction and connection method throughout. Field made duct components are NOT acceptable. Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (+10 w.g.).

Provide elbows, duct, diffusers, plenum, clamp & gasket, boots, saddle registers and caulk as required by drawings for underground installation. Ductwork shall be closed cell plastic material

that is recyclable, does not emit volatile organic compounds, and conforms to ASTM-D2412. Ductwork shall be resistant to mildew, mold (UL 181B), and radon gas (BSS 7239-88). Ductwork shall not rust or crack under external stress or strain. Ductwork shall have integral R-10 equivalent thermal insulation value, without the use of external insulation, per NSF's P374 Protocol and verified by a NSF Thermal Testing Report.

All joints shall be sealed via gasket or bolts and sealant. Clamps and gaskets shall be used on ductwork without flanges. Clamps shall be polyethylene with stainless steel plates and stainless steel screws. Gaskets shall comprise of ¼" thick butyl rubber sealant tape that is water and UV resistant and shall not stain. Gaskets shall comply with ASTM-E84 for flame and smoke spread.

Flanged joints and duct branches shall use a co-polymer adhesive caulking sealant that is water and UV resistant. Flanges shall be connected with stainless steel bolts.

Assembled ductwork shall be able to maintain pressure with no leakage.

Duct systems shall be installed by a manufacturer trained installer.

Duct system performance shall exceed SMACNA's Leakage Class 3 requirements at the system design static pressure.

The complete underground duct system shall be tested for leakage after final assembly. Follow SMACNA air duct leakage test standard. Allow 24 hours for The BlueDuct sealant to cure after final assembly before testing the duct system. Additional curing time may be required in high ambient conditions.

Remove all dust and debris from ductwork prior to occupancy.

1.04 UNDERGROUND FIBERGLASS DUCTWORK:

Underground fiberglass ductwork, including fittings, shall be constructed of fiberglass reinforced plastic Peabody Spunstrand, Inc., Perry Fiberglass or equal.

Duct shall have ICBO, BOCA and SBCCI approvals including a Class 1 inner liner and compliance with UMC Standard 10-1 for non-metallic ducts in accordance with U.L. Standard 181.

Installation shall be in strict accordance with manufacturer's instructions including but not limited to the following: Duct shall be installed in a trench with provisions for good drainage, and an allowance for a minimum of 4" pea gravel or dry sand to completely encase the duct. The top of the duct shall be at least 2-1/2" below the top of the concrete slab.

Field joints shall be watertight by using an internal galvanized sheet metal sleeve secured with sheet metal screws, sealing between the duct ends with an extruded bead of Presstite No. 579.6 non-hardening waterproof mastic and wrapping the joint including all screw heads with Polyken 260 foilastic tape or Nashua 357 tape. In areas of high watertable, field joints shall be of the wet lay-up type in strict accordance with the manufacturer's instructions. This includes thoroughly cleaning and sanding areas to be joined and using polyester resin and fiberglass mat and/or woven roving.

Register boots shall be constructed of 20 gauge galvanized sheet metal with a 1" flange secured to the duct with sheet metal screws and using the mastic as a seal and the Polyken or Nashua tape for the wrap including all screw heads. The entire boot shall then be encased in concrete covering well around and below the taped joint.

The insulating value of the duct shall be R-8.

Underground supply and/or return air plenums shall be round, and made of the same material as the duct. They shall be of one piece construction including the stub outs for connecting to the ductwork, and bottom and top end caps. Flanged sheet metal is connected to the field cut hole in the top end cap as described for register boots.

1.05 REGISTERS, GRILLES AND DIFFUSERS:

Furnish and install all registers, grilles and diffusers as specified hereinafter and as designated on the Drawings. Opposed blade, heavy duty dampers shall be used on systems having two or more duct openings where balancing of air discharge or intake is required. Grilles may be used where there is only one opening and where balancing is not required.

Diffusers, registers, and grilles shall be provided as listed in the schedule on the Drawings. All registers, grilles and diffusers shall be of size and capacity with special requirements, frames, dampers, blank-off baffles, etc., as listed in the schedule and as designated. Opposed blade, heavy duty dampers shall be provided on all units unless designated otherwise on the Drawings.

Louver faced ceiling diffusers shall have a minimum of three (3) inner diffuser cones plus the outer shell unless scheduled otherwise.

The installed location of all ceiling diffusers, registers, and grilles shall be as shown on the Reflected Ceiling Plans.

The finish on all aluminum registers, grilles and diffusers shall be etched to a lustrous satin finish and coated with a clear acrylic lacquer, or white finish as noted below and/or on the Drawings. All steel units shall have white enamel finish, unless noted otherwise. Interior of perforated diffusers shall be painted black.

All ceiling mounted registers, grilles and diffusers shall be white unless noted otherwise. All floor mounted registers, grilles and diffusers shall be satin anodized without mounting holes unless otherwise noted.

Ceiling registers, grilles and diffusers in fire rated ceilings shall have an outer cone of 24 gauge (minimum) steel construction and shall have UL Fire Resistance Classified fire dampers with radiation shields.

Registers, Grilles and Diffusers shall be Tuttle and Bailey, Carnes, Anemostat, Titus, J & J Register, Metal Industries, Grillmaster, Krueger, Price, Reliable, Nailor or equal.

1.06 AIR HANDLING UNITS:

Furnish and install medium pressure draw-through single zone air handling units as shown and detailed on the Drawings. Units shall be complete with mixing box, air blender, water heating coil, direct expansion cooling coil, fan and motor and insulated cabinet.

Cabinet shall be of sectionalized construction and fabricated of galvanized steel or steel with an enamel coat finish. The cabinet panels shall be removable for access and shall be internally insulated with 2 inch thick foam insulation. Cooling coil section shall include drain pan and all coil headers shall be enclosed within the cabinet. Cabinet panels shall be fabricated of standard metal gauges as listed by the manufacturer. Drain pan shall be piped to a floor drain with a water seal trap in the drain piping.

Unit shall be constructed of a complete frame with removable panels. Removal of side panels must not affect the structural integrity of each module. The casing must be able to withstand up to six-inches positive or four-inches negative static pressure. All exterior wall panels shall be made of minimum 24-gauge G90 galvanized steel. Closed-cell gasketing shall be where modules are joined. The entire unit shall be mounted on a continuous 6 inch high base rail which wraps around all 4 sides. Unit shall be double-wall constructed to prevent fiberglass erosion into the airstream and to allow cleaning of the unit interior. Interior wall shall be [20-gauge solid] [18-gauge perforated plate] galvanized steel. Foil faced insulation is not acceptable. Units shall have an insulated, double-wall stainless steel drain pan under cooling coil section(s) for drainage of condensate. Drain connections are to be provided on both sides of the unit. One side shall be piped to a floor drain with a water seal trap. Full sized hinged removable double-wall access doors with two step safety handles shall be provided for quick access to the interior of the unit casing. Doors attached by screws or doors not continuously gasketed are not acceptable. Units shall be factory insulated with 2 inch thick, high density fam insulation. All connecting channels shall be insulated to prevent sweating.

Fans shall be multiblade type and may have forward curved, backward inclined or airfoil type blades.

Fans shall be dynamically balanced single width, single inlet, direct drive plug fans rated in accordance with AMCA Code No. 210. Fans and motors shall be selected to be capable of 120 percent of nominal speed when controlled by an adjustable frequency drive. Fans shall be mounted on spring type vibration isolators.

Air mixing boxes for air handling units shall be constructed similar to unit cabinet and shall include interlocked outdoor air and return air dampers, duct flanges, and nylon bushing for the damper rods.

The outside air damper shall be a high efficiency type with less than 1 percent leakage at 2 inches static pressure.

Filters shall be Cambridge, Farr, Continental, AAF, or equal 2 inch pleated throwaway filters. Filter efficiency shall be MERV 13 based upon ASHRAE Standard 52-68. Furnish and install magnehelic gauges to measure the pressure drop across the filters. Furnish and install separate gauges for each filter bank. The changeout pressure drop shall be marked.

Air Blenders shall be static mixing devices of the rotary turbulating design, by Blender Products, Inc., consisting of radially extending turbulators. Units shall be completely fixed devices, with no moving parts. Standard fabrication shall be of all welded .080" thick aluminum, .125" on air

blenders larger than 96", construction. Steel units shall be epoxy or PVC coated to protect against rust and contaminated air. All units shall be factory built and tested. When multiple blenders are used, they shall impart a counter rotational mixing of the air streams to each other. Simple mixing devices which do not produce expanding radial discharge with counter rotational mixing will not be acceptable. The mixing device shall perform at face velocities from 500 FPM through 2500 FPM with no loss in mixing performance. The complete mixing section shall be constructed with proper mixing distances such that the two airstreams yield a maximum temperature standard deviation through a plane parallel with Blender at the discharge of the mixing section shall be 6 degrees F, and shall provide even airflow and temperature across filters, coils and control thermostats to insure accuracy of averaged temperature reading.

Coils shall be copper tube and aluminum fins mechanically bonded together. Coils shall have galvanized steel casing and water coils shall be drainable type. Coils shall include a vent at the highest point and shall be circuited for counterflow of air and water. Steam coils shall be steam distributing type. Coil face velocity for coils shall not exceed 500 fpm, unless noted otherwise on the schedule. All coil connections shall be on the same side. All cooling coils shall be ARI Standard 410 (Latest Edition) certified or the coil capacity shall be 120 percent of the cooling BTUH capacity specified. Chilled water cooling coils shall be downstream of the heating coil.

Provide a refrigerant detection system and control panel with BAS connection for refrigerant mitigation. Coordinate with BAS contractor.

Motors shall be selected at 120 percent of fan brake horsepower requirements.

Units shall be mounted on spring type vibration isolators as recommended by the manufacturer.

For units with multiple fan arrays (2+ fans), fans motors shall be wired back to a single point power connection and individual motor overload protection shall be provided. This wiring and overload protection may be factory or field installed, and shall be the responsibility of Div 230800. Wiring from the power source to a single field-installed Variable Frequency Drive (if specified) and from the VFD to the single point power connection at the unit shall be the responsibility of Div 26.

Unit capacities and design conditions shall be as listed in the schedule on the Drawings.

Air Handling Units shall be Daikin, Carrier, Trane, York, Johnson Controls, Pace Air Systems, or equal.

1.07 CONDENSING UNIT:

Furnish and install a condensing unit where shown on the Drawings. Unit shall be complete with compressors, condensers, condenser fans and motors, louvered coil guards, low ambient lockout, operating and safety controls. Unit shall be ARI Certified and Underwriter's Laboratories Listed.

Each unit shall be specifically designed for outdoor condensing unit application and include a weatherproof cabinet. Furnish unit configuration, layout, performance and electrical characteristics as shown on project plans and schedule. The unit shall undergo an operational test prior to shipment. The factory test shall include a refrigeration circuit check test, a unit safety control system operations checkout, and a final unit inspection. The complete unit shall be ETL

listed. Unit shall be completely factory assembled and shipped in one piece. This unit to be shipped with nitrogen holding charge. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit. All scheduled capacities and face areas are the minimum accepted value. All scheduled amps, KW, and HP are maximum accepted values that allow scheduled capacity to be met.

Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings. Access shall be provided to compressors and electrical and controls components. The unit base frame shall be constructed of 13 gauge pre-painted steel to prevent base rail corrosion. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.

Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with unit shall be number and color coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch circuit short circuit protection, 115 volt control circuit transformer and fuse, system switches, and a high temperature sensor. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply and return fan motors shall have contactors and external overload protection. Knockouts shall be provided in the of the main control panels for field wiring entrance. All 115-600 volt internal and external wiring between control boxes and components shall be protected from damage by dedicated electrical raceways. The receptacle shall be powered by a field supplied 115V source. Unit SCCR Rating to be 65 kAIC minimum. Unit shall be provided with phase, voltage and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage or on phase reversal. Unit shall be provided with a safety shutdown terminal for installation of field emergency input. All electrical options shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

Unit shall be provided with a safety shutdown terminal for installation of field emergency input

All Units shall provide the Energy Efficiency specified EER and IEER per the schedule equipment or higher. Condenser fans shall be direct drive, axial type designed for low tip speed and vertical air discharge. Fan blades shall be constructed of steel and riveted to a steel center hub. Condenser fan motors shall be heavy-duty, inherently protected, three-phase, non-reversing type with permanently lubricated ball bearing and integral rain shield. Condenser coils shall be an all aluminum design, and mounted on polymer brackets, to minimize di-electric corrosion. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. Each condenser coil shall be factory leak tested with high-pressure air under water.

Units shall have at least one condenser fan controlled to maintain positive head pressure. SpeedTrol™ condenser fan speed control shall be added to the last fan off on each refrigeration circuit to provide cooling operation to ambient temperatures down to 0° F. Fan speed control shall be field adjustable.

Each unit shall have two independent refrigeration circuits for redundancy. Each circuit shall be complete with a low pressure control, filter-drier, liquid moisture indicator/sight-glass, thermal expansion valve, and a manual reset high pressure safety switch. The thermal expansion valve shall be capable of modulation from 100% to 25% of its rated capacity. Sight-glasses shall be accessible for viewing without disrupting unit operation. Each circuit shall be dehydrated and factory charged with Refrigerant R32 and oil. The lead compressor shall be a variable speed compressor for load control as required by ASHRAE 90.1-2013.

Each condensing unit shall be configured for Full Refrigeration Only Controls (ROC) and shall operate in conjunction with a field-installed direct digital control (DDC) system serving the associated air handling unit. The field-installed controls shall provide all application-specific control functions, including cooling demand determination, discharge air temperature regulation, compressor capacity commands, operating schedules, and required system interlocks.

All temperature, humidity, and other sensors required for air handling system operation shall be field furnished, installed, and connected to the field-installed DDC system. The condensing unit shall not require factory-installed application-specific sensors or building automation network integration

The field-installed DDC system shall provide a modulating 0–10 VDC analog signal to the condensing unit's MicroTech® refrigeration controller for compressor cooling capacity control. The signal shall represent the requested cooling capacity from minimum to maximum output. A separate cooling enable contact shall be provided and interlocked with the associated air handling unit's operation and required safety conditions. The factory-installed refrigeration controller shall remain responsible for compressor modulation, staging, and internal refrigeration system protection.

The field-installed DDC system shall provide all necessary control wiring and connections between the condensing unit and associated air handling unit, including cooling enable, capacity modulation, and applicable operating status and alarm monitoring. All field control wiring and sequences shall be coordinated with the manufacturer's published installation and operation instructions and project-specific wiring diagrams.

The unit controller shall include an oil return mode of operation which automatically starts when a circuit has been operating at low capacity for an extended period. Oil return mode ensures adequate lubrication is always available to the compressors. The oil return mode will be initiated when the cumulative time a circuit has been operating in the normal circuit state at low capacity exceeds a time limit indicating oil return is required (e.g. 120 minutes). The low-capacity threshold will depend on the unit size and the type of compressors that are operating on the circuit. The unit controller tracks the accumulated number of minutes each circuit operates at low capacity. When the low capacity run time exceeds the time limit, the compressors will increase speed to the oil return speed specified for each unit size and compressor type. Fixed speed compressors will stage up to return oil to the compressors. The oil return sequence timer runs for 5 minutes if there is a variable speed compressor on the circuit. The time runs for 1 minute if all

compressors on the circuit are fixed speed compressors. If the refrigeration system is commanded off while oil return mode is active (e. g. due to the space temperature being satisfied or a system alarm being activated), the compressors will return to oil return mode when the refrigeration system is next activated to complete the remaining duration of the oil return sequence timer.

Compressor shall have a 5-year parts warranty from time of acceptance.

Shop drawings of the refrigerant piping shall be submitted as specified in Division 1 of the Contract. The shop drawings shall incorporate the following:

Diagrammatic layout of the piping showing the general arrangement of the refrigerant piping length, fittings, equipment and elevations.

Refrigerant piping sizes.

The Contractor shall verify the acceptability of the refrigerant piping arrangement and sizes with the refrigeration equipment supplier/manufacturer and shall submit shop drawings. See Specification Section 23010.

The Condensing Unit shall be from the same manufacturer as the air handling unit.

1.08 REFRIGERANT PIPING AND SPECIALTIES:

The Contractor shall furnish and install refrigeration piping, as detailed on the Drawings and as required.

Insulate suction piping with 1/2 inch of fire and smoke rated Armaflex, or equal. The insulation shall not exceed ratings of 25 Flame Spread and 50 Smoke Developed as rated by UL 723. All insulation exposed to outdoor weather conditions shall be additionally covered with a 20 mil PVC jacket sealed watertight. The PVC cover shall have solvent welded joints and seams. Piping support brackets shall be B-Line Model B2417 or equal. The insulation shall run continuous through the brackets with hanger shields.

The Contractor shall follow recommendations of the equipment manufacturer when piping, installing, and starting the systems.

Specialties shall include a charging valve, flexible connectors, condenser plunge valve and condenser shut-off valve on each system, as required for operation. Provide sight glasses, dryers, strainers, solenoid valves, expansion valves, etc., as noted on the Drawings and/or as required for proper operation.

Accessories shall be Henry, Sporlan, Alco, or equal.

Refrigerant piping shall be type "L" copper tubing, hard drawn with wrought copper solder type fittings suitable for connection with silver solder. The piping shall be charged with dry nitrogen while constructing the joints. A removable type dryer strainer shall be installed in the liquid line. A three valve bypass shall be provided for the strainer. After the refrigerant piping has been completed, the refrigerant system shall be pressure tested at a pressure of 300 psi (high side) and 150 psi (low side). While the system is being pressure tested, an electronic leak detector shall be used to check for leaks. Pressure shall be maintained on the system for a minimum of 12 hours.

The system shall be evacuated when the surrounding ambient air is not less than 60 degrees F. A minimum vacuum of 5.2 MM of mercury absolute shall be pulled on the system and maintained for 24 hours. The vacuum pressure displacement shall be not less than 5 cfm. The vacuum shall be checked with an electronic gauge. All pipe shall be supported from the building structure in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze type hangers. The use of wire or perforated metal to support piping will not be permitted. Hanging piping from other piping will not be permitted. Spacing of pipe supports shall not exceed 8 feet for pipes up to 1-1/4 inches and 10 feet on all other piping. Hangers shall pass around the insulation and an 18 gauge steel protective band, 12 inches long shall be inserted between the hangers and the insulation.

1.09 REFRIGERATION SYSTEMS (except precharged systems):

Piping Tests: After the refrigeration piping and fittings have been assembled, all flux shall be removed from connections and all lines shall be clean. The piping system shall be blown out with dry nitrogen to remove any free water or dirt which might be present. The refrigerant lines shall be charged with dry nitrogen and proven tight at minimum gauge pressures of 300 psi on the high side and 150 psi on the low side. The system shall hold these pressures for a period of 24 hours without pressure drop except for pressure change due to temperature differential.

Evacuation and Dehydration: After the piping system has been proven tight by the pressure test, evacuation and dehydration of the system shall be accomplished using the double evacuation method described in the following paragraphs.

Equipment and Conditions: The Contractor shall provide a two-stage, high vacuum pump capable of pumping down to 100 microns or lower while evacuating the system, and of adequate displacement to evacuate the various systems within a reasonable period of time based upon maximum vacuum of 5.16 millimeters of mercury absolute. He shall also provide a wet-bulb vacuum indicator, a supply of 100 percent methyl alcohol for use with this instrument and a temperature-pressure conversion chart for 100 percent methyl alcohol. The evacuation shall be done only when the ambient air temperature is 50 degrees F. or higher. The Contractor is cautioned to go no lower than 5.16 millimeters of mercury absolute on the evacuation procedure to prevent the formation of ice in the piping system.

Primary Evacuation: This procedure begins after the vacuum pump and wet-bulb vacuum indicator have been properly attached to the piping system. The vacuum pump is operated continuously until the pressure within the system reaches 5.16 millimeters of mercury absolute at which point the pump is stopped.

Secondary Evacuation: Using the same dry refrigerant with which the system is to be charged, break the vacuum and bring the system pressure to a point slightly above atmospheric pressure. Start the vacuum pump and using the wet-bulb vacuum indicator, evacuate the system to 5.16 millimeters of mercury absolute. Stop the vacuum pump and charge the system with a full charge of dry refrigerant.

Operating Tests: The systems shall be operated as near as possible to design conditions for 48 hours, not necessarily continuous. During this time sufficient data shall be logged to provide proof of satisfactory operation. The collected data shall be submitted to the Architect/Engineer for approval. The Architect/Engineer shall be given advanced notice of the testing period so he

may be present for observation of same should he desire. At the expiration of the test period all systems shall be fully charged and free of leaks.

1.10 TUBULAR CENTRIFUGAL IN-LINE EXHAUST FANS:

Furnish and install a tubular centrifugal in-line exhaust fan where shown on the Drawings. Fan shall be complete including housing, airfoil fan wheel, diffuser section, motor mounting support and mounting frame as a factory assembled unit.

The housing shall be constructed of continuously welded heavy gauge steel to assure no air leakage.

The housing and bearing support shall be constructed of structural steel members to prevent vibration and rigidly support the shaft and bearings.

The wheel shall be of the non-overloading airfoil centrifugal type. Wheels shall be statically and dynamically balanced. The wheel cone and fan inlet cone shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency. Welded steel vanes shall straighten the flow of air from the fan discharge and support bearings and drives.

Turned, precision ground and polished steel shafts shall be sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class.

Close tolerances shall be maintained where the shaft makes contact with the bearing. Bearings shall be heavy duty, grease lubricated, self aligning ball bearing or roller pillow block type. Extended lubrication lines shall be provided with external grease fittings. Bearings shall be selected for a minimum average of 200,000 hours life at maximum operating speed for each pressure class.

Fan performance shall be based on tests conducted in accordance with AMCA Standard 210 test code for air moving devices, and fans shall be licenses to bear the AMCA Certified Ratings Seal.

After assembly each fan shall be given a final balance test at the specified operating RPM to insure smooth vibration free operation.

For exhaust applications, provide a back draft damper.

Tubular Centrifugal Fans shall be Greenheck, Cook, Penn, Carnes, Twin City, Aerovent, PennBarry, ACME, or equal.

1.11 PROPELLER EXHAUST FAN:

Furnish and install Cook Type AWD or equal, propeller sidewall exhaust fan as shown and scheduled on the Drawings. Fans shall be direct drive and shall be complete with a square venturi frame and motor support of welded steel and a cast aluminum propeller.

Fans installed in chlorine rooms shall have the entire unit painted with Eisenheiss coating.

Propeller Exhaust Fans shall be Loren Cook, Lau-Bayley, Greenheck, Aerovent, Power-Line, Penn, Twin City Fan, Aerovent, PennBarry, ACME, or equal.

1.12 PROPELLER EXHAUST FAN:

Furnish and install Cook Type APD, or equal, propeller sidewall exhaust fans as shown and scheduled on the Drawings. Fans shall be direct drive and shall be complete with wall mounting collar, motorized backdraft damper, venturi fan panel and polyvinyl coated inlet screen.

The backdraft damper, venturi fan panel, and inlet screen shall mount in the wall mounting collar and shall be integral components of the unit. The entire unit shall be constructed to drain any moisture to the outside of the building.

Fans installed in chlorine rooms shall have the entire unit painted with Eisenheiss coating.

Propeller Exhaust Fans shall be Loren Cook, Greenheck, ACME, Penn, Twin City Fan, Aerovent, PennBarry, or equal.

1.13 BELT DRIVE CABINET FAN:

Furnish and install a Greenheck Model BCF belt drive cabinet fan or equal where shown on the Drawings.

Fan capacity shall be as listed in the schedule on the Drawings.

Duct mounted supply, exhaust or return fans shall be of the centrifugal, belt driven in-line type. The fan housing shall be of the rectangular design constructed of heavy gauge galvanized steel and shall include rectangular duct mounting collars.

A hinged or removable panel shall be provided in the fan cabinet of sufficient size to permit access for service to all of the fan's internal components without dismantling the cabinet.

The fan wheel shall be of the galvanized steel, forward curved, centrifugal type. Wheels shall be dynamically and statically balanced.

Motors shall be of the heavy duty type with permanently sealed ball bearings. The wheel shaft shall be ground and polished steel mounted in permanently sealed pillow block bearings. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulleys shall be adjustable for final system balancing.

All fans shall bear the AMCA Certified Ratings Seal for air performance.

For exhaust applications, provide a back draft damper.

Belt Drive Cabinet Fans shall be Greenheck, Cook, Carnes, Pace, Penn, Twin City Fan, Aerovent, PennBarry, ACME, or equal.

1.14 CEILING/IN-LINE EXHAUST FANS:

Furnish and install ceiling and in-line exhausters where shown on the Drawings. Units shall be complete with centrifugal fans, rubber mounted motor, insulated steel housing, eggcrate aluminum grille, and backdraft damper. Motor shall be 115 volt, single phase with integral motor overload protection.

Fan capacity shall be as listed in the schedule on the Drawings.

Fan RPM shall not exceed 1200 RPM.

Ceiling Exhaust Fans shall be Penn, Pace, Cook, Carnes, Greenheck, Twin City Fan. Aerovent, PennBarry, ACME, or equal.

1.15 CEILING EXHAUST FANS:

Furnish and install ceiling exhaust fans and combination fan-light units as specified herein and noted on the Drawings. All units shall be furnished with flush anodized aluminum eggcrate inlet grilles, motor and fan assembly, 120 volt, 60 hertz, single phase plug-in motor, backdraft damper and accessories noted. Fans shall be Underwriter's Laboratories approved. Units shall be AMCA air and sound rated.

Fan shall have the capacities listed in the schedule on the Drawings.

Fan RPM shall not exceed 1200 RPM.

Ceiling Fans shall be Penn, Pace, Cook, Carnes, Greenheck, Twin City Fan, Aerovent, PennBarry, ACME, or equal.

1.16 MANUAL DAMPERS:

Furnish and install splitter dampers and balancing dampers in the ductwork where shown and wherever required to accurately balance the system. Splitter dampers shall be minimum of 20 gauge, rigid to prevent vibration and held securely in place at any setting with heavy lock quadrant.

Balancing dampers in rectangular ductwork shall be Ruskin Model No. MD-35 or equal complete with rigid frame, 16 gauge galvanized steel blades, 8 inch maximum blade width, synthetic bearings and heavy lock quadrant with position indicator.

Manual dampers at branch duct tees shall have integral spin-in fittings. Branch duct dampers and tees of equal or greater size to the main duct shall have an integral shoe type fitting. Balancing dampers shown in round ductwork shall be heavy gauge with a locking quadrant on one side and a shaft extending through the other side of the duct. Manual dampers with integral takeoff fittings shall be as manufactured by Cardinal Supply, Sheet Metal Connectors, Inc. or equal.

Manual Balancing Dampers shall be Ruskin, Greenheck, Air Balance, Cesco, Pottorff or equal.

1.17 LOUVERS:

Furnish and install Ruskin Model ELF6375DX or equal louvers where shown on the Drawings. Louvers shall be stationary drainable type with a drain gutter in each blade and downspouts in

jambs and mullions. Blades shall be contained within a single 6" frame. Louver construction shall be 0.080 inch thick 6063 extruded aluminum alloy frame with integral caulking slots. Blades shall be 0.080 inch thick 6063 extruded aluminum alloy at 37-1/2 degree angle on approximately 6 inch centers. A birdscreen shall be contained within a removable frame. Provide an extended sill with end dams.

Louver components (heads, jambs, sills, blades, and mullions) shall be factory assembled by louver manufacturer. Louver sizes too large for shipping shall be built up by contractor from factory assembled louver sections to provide overall size required.

Louver shall be finished with baked acrylic enamel in color selected by the Architect, from a standard color chart.

Louver pressure drop shall not exceed the values shown on the Drawings and shall bear the AMCA seal. All ratings shall be in accordance with AMCA Standard 500 and shall include the effect of the bird screen.

Louvers shall be Airolite, American Warming and Ventilating, Inc., Carnes, Louvers and Dampers, Inc., Arrow, United, Cesco, Ruskin, Dowco, Industrial Louvers, Greenheck, Pottorff, Construction Specialties, NCA, Nailor, or equal.

1.18 AUTOMATIC TEMPERATURE CONTROL:

Install the automatic temperature control dampers, air flow monitoring devices, openings for air flow switches, alarms and control devices as provided by the Automatic Temperature Control Contractor.

These dampers and devices shall be installed under the direct supervision of the Section 230900, AUTOMATIC TEMPERATURE CONTROL Contractor and in strict accordance with the manufacturer's recommendations.

Caulk around all sides of high efficiency damper frames.

1.19 FAN-POWERED VAV TERMINALS (DDC):

Furnish and install parallel fan powered variable air volume terminals of sizes and capacities as shown on the Drawings.

At maximum cooling the terminal shall supply all primary air. At minimum cooling the primary air cfm shall be 30 percent of design cfm unless designated otherwise in the schedule on the Drawings.

All performance shall be ARI certified.

Damper leakage shall be less than 1 percent of maximum cfm at 3 inches static pressure.

The terminal manufacturer shall provide a flow cross or two (2) pipe sensor suitable for interfacing with a differential pressure transducer. The flow sensor shall include auxiliary taps for use by the Balancing Contractor. The transducer shall be supplied by the temperature control contractor.

Fans shall be forward curved with direct drive, 4-speed or variable speed, permanently lubricated electronically commutated type motors with either integral motor overload protection and disconnect switch or a manual motor starter with thermal overloads, with solid neutral bus and number of poles required for connected voltage. Fans shall be dynamically balanced and mounted on rubber vibration isolators.

The casing shall be constructed of coated steel meeting SMACNA or ASHRAE Standards. Internal insulation shall meet the requirements of NFPA Bulletin 90A and UL 181.

Heating coils where required shall be factory mounted and sized as shown in the schedule on the Drawings. Coils shall be designed for hot water. Coils shall be single tube seamless copper 5/8 inch OD. Tubes and U-bends shall be combined in a single tube using silver brazing. Supply and return connections shall be 3/4 inch internal threaded. Bronze, spring type turbulators shall be furnished, if required to meet capacities needed where water velocities are 4 feet per second or less. Coils shall be tested at 250 psi air pressure under water.

Casings shall be constructed of heavy galvanized steel and shall have 12 inch long by 6 inch wide access panels on the inlet of the heating coil. The access panels shall be gasketed and screwed to the bottom of the heating coil section. Alternatively, the bottom panel of the FPVAV may be removable for access to the inlet side of the heating coil. The bottom panel shall be split so approximately 1/2 is removable and 1/2 remains in place. The removable panel shall be removable with 3/4 turn fasteners. The FPVAV shall be supported in a way that does not block access to this bottom panel.

Fan-powered VAV Terminals shall be Carnes, Enviro-Tec, Krueger, Nailor, Price, Titus, Trane, Tuttle and Bailey, York or equal.

1.20 VAV/REHEAT TERMINALS (DDC):

Furnish and install variable air volume terminals and reheat terminals of sizes and capacities as shown on the Drawings.

At minimum cooling the VAV terminal shall be 30 percent of design cfm unless designated otherwise in the schedule on the Drawings.

All performance shall be ARI certified.

The terminal manufacturer shall provide a flow cross or two (2) pipe sensor suitable for interfacing with a differential pressure transducer. The flow sensor shall include auxiliary taps for use by the Balancing Contractor. The transducer shall be supplied by the temperature control contractor.

The casing shall be constructed of coated steel meeting SMACNA or ASHRAE Standards. Internal insulation shall meet the requirements of NFPA Bulletin 90A.

Heating coils where required shall be factory mounted and sized as shown in the schedule on the Drawings. Coils shall be designed for hot water. Coils shall be single tube seamless copper 5/8 inch OD. Tubes and U-bends shall be combined in a single tube using silver brazing. Supply and return connections shall be 3/4 inch internal threaded. Casings shall be constructed of heavy

galvanized steel and shall have 12 inch long by 6 inch wide access panels on the inlet of the heating coil. The access panels shall be gasketed and screwed to the bottom of the heating coil section. Bronze, spring type turbulators shall be furnished, if required to meet capacities needed where water velocities are 4 feet per second or less. Coils shall be tested at 250 psi air pressure under water.

VAV Terminals shall be Carnes, Enviro-Tec, Krueger, Nailor, Price, Titus, Trane, Tuttle and Bailey, York or equal.

1.21 OUTSIDE AIR DAMPER:

Automatic control dampers shall be Ruskin Model No. RCD46/CD356, Cesco, Greenheck or equal and have 16 gauge galvanized steel blades with integral structural reinforcing running full length of the blade. The frame shall consist of 16 gauge galvanized steel. There shall be no blade over 8 inches in width, 48 inches in length, without support, and all damper bearings shall be synthetic type. Blade edge seals shall be EPDM rubber or PVC coated polyester fabric suitable for -25ºF to 180ºF mechanically locked into the blade edge and jamb seals shall be of the flexible metal compression type. Dampers shall be AMCA certified for leakage not greater than 6 cfm per square foot at a 4 inch w.g. pressure differential (24 inch wide). Modulating dampers shall be opposed blade.

1.22 DAMPER ACTUATORS:

Size each actuator to operate dampers with sufficient reserve power to provide smooth modulating action or 2-position action as specified.

Actuators shall be 115 volt or 24 volt, single phase, as required by the Sequence of Operation.

On-off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall have a manual positioning mechanism accessible on its cover. DC motors shall be brushless and be protected from overload at all angles of rotation. Run time shall be constant and independent of torque. If required, 2 SPDT auxiliary switches shall be provided with one switch having the capability of being adjustable. Actuators with switches shall be constructed so an electrical ground connection is not required to meet agency listings. Actuators shall be UL listed and CSA certified, have a 2 year warranty, and be manufactured under ISO 9001 International Quality Control Standards.

Furnish spring return actuators for dampers. Dampers larger than 25 sq.ft. shall be equipped with two damper motors. Size spring-return motors for running torque rating of 133 inch-pounds.

Damper Actuators shall be Belimo or equal.

1.23 TESTS:

General:

The Contractor shall furnish a competent individual familiar with the installation to assist the Balancing Company and make the necessary mechanical equipment adjustment as directed by the

Balancing Company. The Contractor shall also furnish the necessary ladders, scaffolding, etc., needed for access to test and balance all systems.

The Contractor shall provide replacement pulleys, etc. as required to properly balance the ventilation equipment.

The following tests shall be performed on the respective systems. Tests shall be repeated until each system is proven acceptable.

Heating and Cooling:

The Contractor shall employ an independent testing and balancing company to properly balance the water flow to and from all coils and equipment and make any adjustments necessary in balance valves, etc., to meet the required flows.

The Contractor shall furnish to the Architect/Engineer one electronic typewritten copy of tabulations of the water flows. This tabulation shall include unit number, room number, gpm for all connections, showing both design gpm and actual gpm. The Contractor shall tabulate all pump pressure differentials, gpm and pump motor current and voltage readings taken after all terminals and equipment have been balanced. List the bypass gpm on 3-way valves. The Contractor shall operate the controls (thermostat, etc.) to verify that the gpm changes from no flow to design flow and shall designate the results in the report.

Ventilation and Air Conditioning:

The Contractor shall make thorough tests of the following systems.

Air Systems:

The Contractor shall make a thorough test of all air systems. He shall employ an independent testing and balancing company to properly balance the air flow to and from all openings and make any adjustments necessary in fan speeds, etc., to meet the required air volume.

The Contractor shall furnish to the Architect/Engineer one electronic typewritten copy of tabulations of the air volumes. This tabulation shall include unit number, room number, supply, return, or exhaust CFM's for all openings, showing both required CFM and calculated CFM, grille size, minimum cooling VAV terminal CFM, heating VAV terminal CFM and maximum VAV terminal CFM. The Contractor shall also submit a tabulation of all fan RPM's, static pressure, CFM's and fan motor current and voltage readings taken after the terminals have been balanced.

Independent Testing and Balancing Company:

Testing and balancing work shall be executed under the direct supervision of a registered professional engineer having an experience record of not less than five (5) years in the mechanical contracting industry, engaged in testing, balancing and adjusting of air and hydronic mechanical systems for not less than two (2) years of that time; or, under the direct supervision of a qualified testing, adjusting and balancing supervisor, possessing certification from the National Environmental Balancing Bureau (NEBB). Testing and balancing work shall not be done by the installing contractor.

Comply with the applicable procedures in the chapter on Testing, Adjusting and Balancing in the latest ASHRAE Edition of the Systems Handbook.

Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations, and calibration histories for each instrument shall be available for examination.

Accuracy of measurements shall be in accordance with the applicable measurement means as listed in the chapter on Measurement and Instruments in the latest edition of ASHRAE Fundamentals Handbook.

Allowable Tolerances:

Tolerances of adjustment for air handling systems are plus or minus 5% for supply systems and plus or minus 10% for return and exhaust systems from figures shown on the Drawings.

Tolerances of adjustment for hydronic systems, are plus or minus 10% of design conditions shown on the Drawings.

Rebalancing and adjustments found necessary to maintain and to achieve satisfactory operating conditions during the contract guarantee period shall be performed by the Testing and Balancing Subcontractor.

Acceptable Testing and Balancing Companies meeting the above requirements are as follows:

Balancing Professionals, Inc.
Precision Test and Balance
ReCom, Inc.
Systems Management and Balancing, Inc.
Tab, Inc.

Independent testing and balancing companies not listed above must submit for approval prior to the Bid.

END OF SECTION 230800

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SECTION 230900 - AUTOMATIC TEMPERATURE CONTROL/BUILDING AUTOMATION SYSTEM

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 230100, General Provisions, in its entirety, including references to the General Construction Specifications, are hereby adopted and made part of these Specifications

The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete automatic temperature control systems, as described herein and/or shown on the Drawings. This includes all piping, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

Furnish and install an Automatic Temperature Control/Building Automation System (ATC/BAS) as manufactured by Alerton, CSI, Honeywell (Excel), Johnson Controls (Metasys), KMC, Schneider Electric (TAC/IA Series), or Siemens (Apogee), Siemens (Talon), or Trane (Summit).

The ATC/BAS shall be installed by the manufacturer's trained personnel. The Contractor shall be a Factory Authorized Distributor or Branch Office certified to engineer, install and service the brand of temperature control equipment specified herein. The Contractor shall have represented the brand of control equipment for the proposed installation for a minimum period of 5 years. Installation by mechanical contractors will not be allowed.

ATC/BAS components shall be the manufacturer’s latest standard design that complies with the specification requirements and in conformance with the following applicable standards for products specified:

A. American Society for testing and materials, ASTM
B. Institute of Electrical and Electronic Engineers, IEEE
C. National Electrical Manufacturers Association, NEMA
D. Underwriters Laboratory, UL (UL 916)
E. FCC Regulation, Part 15, Section 156
F. National Fire Protection Association, NFPA
G. Local building codes

1.02 WORKMANSHIP:

Installation workmanship must be the highest quality.

Panels must be amply sized to allow all components to be permanently mounted with ample space for wiring between components and around the panel perimeter. Groups and bundles of control wiring shall be in a gutter system with a removable cover.

Control wiring shall be cut with spare length at both ends to allow for connections at both ends with ample wire length and no splices adjacent to the connection. Control wiring shall not be spliced inside control panels. All wiring shall terminate on labeled terminal blocks or device

mounted terminals under screws. All wires terminating under a common screw should be the same wire gauge or diameter.

All components must be permanently fastened inside control panels. Components shall be permanently labeled for the systems they serve and their function.

Control wiring must be routed parallel along and perpendicular to structural members.

Control wiring must be routed utilizing the cable tray system where cable tray systems are available.

Control wiring shall be installed in conduit in exposed locations, i.e., Mechanical Rooms and areas with exposed structure (no ceiling). Final connections to control components (valve actuators, damper actuators, etc.) must be by flexible conduit from a J-box set adjacent to the control component.
Control conduit ends must have insulated throats.

1.03 SUBMITTALS:

The ATC/BAS Contractor shall provide an equipment submittal that includes manufacturers' catalog data describing each item of control equipment or component to be provided and installed on the project.

The Contractor shall submit CAD generated schematic drawings for the entire control system for review and approval before beginning installation of the control system. Included in the submittal drawings shall be a one page diagram depicting the system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and must show: all controls, start-stop arrangement
for each piece of equipment, equipment interlocks, wiring terminal numbers and any special connection
information required for properly controlling the mechanical equipment. The submittal shall include a bill of material reference list as well as equipment sequences of operation.

The Contractor shall submit all software logic flowcharts and graphics for the control system for review and approval before programming shall begin.

1.04 PROTECTION OF SOFTWARE RIGHTS:

Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:

A. Limiting use of software to equipment provided under these specifications.
B. Limiting copying.
C. Preserving confidentiality.
D. Prohibiting transfer to a third party.

1.05 ELECTRICAL INSTALLATION:

The ATC/BAS Manufacturer shall be responsible for installation of all of the control wiring to provide for a complete operating system. This electrical wiring shall include but not be limited to

the following:

A. The term "control wiring" is defined to include the providing of wire, conduit, and miscellaneous materials as required for the mounting and connecting of electric or electronic control devices. Control wiring includes but is not limited to the line and low voltage communications and power wiring necessary for the proper operation of the DDC controllers as described herein. Control wiring shall be grouped and tied together along building lines parallel with and perpendicular to structural members. Control wiring shall be routed in the cable tray system when such a system is provided by Division 26 - Electrical.

B. All exposed wiring, low and line voltage, shall be run in conduit. Line and low voltage wiring shall be run in separate conduits. Concealed but accessible wiring, except in mechanical rooms and areas where other conduit and piping are exposed shall run in UL plenum rated cable as approved by local codes unless expressly restricted by requirements in the Division 26 specification. Plenum cable shall be installed high enough to provide adequate clearance for ceiling tile removal.

C. All power wiring shall be run by the Contractor. Provide dedicated circuits from circuit breakers provided by the Division 26 electrician to the respective DDC controller (s). This includes the terminal box ASC controllers provided under this section of the specifications.

D. All wiring shall be installed in accordance with local and national codes as defined in the Division 26 specifications.

E. Numbered or color-coded conductors shall be used to allow for future identification and servicing of the control system.

F. All wall mounted sensors/thermostats shall be roughed in using a standard electrical box with conduit in the wall extended to the accessible ceiling area. They shall be mounted in accordance with and at a height to comply with The American's with Disabilities Act (ADA), unless noted otherwise on the Drawings. Mounting sensors with anchors or toggle bolts is not permitted.

1.06 INSTALLATION OF CONTROL VALVES, DAMPERS AND DEVICES:

All automatic control valves, water monitoring devices, flow switches, alarms and control devices shall be furnished by the ATC/BAS supplier and installed under his direct supervision by the Division 22 Contractor as noted in Section 220600 - HEATING.

All automatic control dampers, air flow monitoring devices, flow switches, alarms and control devices shall be furnished by the ATC supplier and installed under his supervision by the Division 23 Contractor as noted in Section 230800 – VENTILATION AND AIR CONDITIONING.

Furnish and install all switches, relays, contactors, etc. required for a complete operating system as specified in the Sequence of Operation.

1.07 FREEZE PROTECTION:

Furnish and install a manual reset freeze protection thermostat on the discharge of each heating coil of each system with a fresh air connection which will shut off the fan motor, fully close the fresh air damper and open the coil valves to full flow whenever the coil outlet air temperature falls below

its setting. This device shall be hard wired to the motor starter/contactor.

1.08 PACKAGED UNIT REMOTE CONTROL PANELS:

Remote control panels furnished by the heating ventilation and air conditioning equipment manufacturers shall be wired and tested by this Contractor. Remote control panels furnished by the heating ventilation and air conditioning manufacturers shall be mounted respectively under Section 22600 and Section 23800 of these Specifications.

1.09 PRODUCTS:

Temperature Sensors:

Temperature sensors shall be linear precision elements with ranges appropriate for application, accurate within 1°F over normal operating range.

A. Space sensors shall be available with concealed setpoint adjustment and override switch. Space sensor shall have a portable service tool jack. Setpoint adjustment shall be capable of being overridden through software. Provide metal sensor guards where shown on the Drawings.

B. Duct mounted averaging sensors shall utilize a sensing element incorporated in a copper capillary with a minimum length of 20 feet. The sensor shall be installed according to manufactures recommendation and looped and fastened at a minimum of every 36 inches and changes in direction.

C. Sunshields shall be provided for outside air sensors.

D. Thermowells for all immersion sensors shall be stainless steel or brass as required for application.

Humidity Sensors:

Humidity sensors shall have a range of 0% to 100% with an accuracy of +/-3%.

Air Velocity Sensors:

The sensor shall have a repeatability within 1% of reading and an accuracy of +/-5% of range.

Differential Pressure Sensor:

The differential pressure sensor shall have an accuracy of +/-2% of range.

Outdoor Pressure Reference Sensor:

Outdoor pressure reference sensors shall be Dwyer Model No. A306. Install in strict accordance with the manufacturer's recommended installation instructions.

Carbon Dioxide/Volatile Organic Compound Sensor:

Siemens Model QPA63 or equal sensor shall be able to monitor both carbon dioxide and Volatile Organic Compound (VOC) concentrations. Sensor shall measure CO2 over a range of 0 – 2000 PPM with an accuracy of +/- 5% full scale. Sensor shall require no maintenance. Ventilation demand calculator shall compare the two demand signals (CO2 and VOC) and output the greater of the two as the common indoor air quality demand signal. Siemens Model ARG64 duct mounting kit shall be used if measurement in duct is specified.

Occupancy Sensor:

Occupancy sensor shall be of the passive infrared or ultrasonic receiver type. As a minimum the occupancy sensor shall provide adjustments for timed-on delay and sensor sensitivity.

Terminal Unit Velocity Sensors:

Sensor shall have an installed accuracy of +/-5% of range and repeatability of +/-25 FPM.

Low Temperature Protection Thermostats:

Shall be the manual reset type. The thermostat shall operate in response to the coldest one foot length of the 20-foot sensing element, regardless of the temperatures at other parts of the element. The element shall be properly supported to cover the entire downstream side of the coil with a minimum of three loops. Separate thermostats shall be provided for each 25 square feet of coil face area or fraction thereof. The thermostat shall be adjustable down to 15°F.

Differential Pressure Switches:

Pressure differential switches shall have SPDT change-over contact, switching at an adjustable differential pressure setpoint. Repeatability shall be better then +/-.02" H_2O.

Current Sensing Relays:

Current sensing relays shall have setpoint adjust, trip indication and five-year unconditional warranty.

Flow Switches:

Flow switches shall be of the paddle type equipped with SPDT contacts to establish proof of flow. Flow switches shall be of the vapor-proof type.

Electric Thermostats:

Thermostats shall have SPDT contacts with a concealed setpoint adjustment from 55 to 85°F. Provide metal thermostat guards where shown on the Drawings.

Control Valves:

Valves shall be selected to meet the individual systems design pressure, temperature and medium. Valves on equipment with outside air capability shall fail open unless noted otherwise. Convertor valves and boiler isolation valves shall fail closed. Two-way valves of 440 CV or less, and three way valves of 91 CV or less, shall be industrial quality ball valves with Belimo actuators as

assembled by Delta Control Products or equal. Valves assemblies shall have a minimum resolution of 250 to 1 and be rated for 250 psi working pressure and 450 F working temperature. Water valves shall be sized for a 2 psi pressure drop except where noted otherwise and low pressure steam valves (< 15 psi) shall be sized for 80% pressure drop of inlet pressure. Valves 2 1/2 inches and larger shall be flanged with a turndown ratio of 40 to 1. Butterfly valves shall be as assembled by Delta Control Products or equal.

Terminal Unit Fan Speed Controllers:

Fan speed controller shall be capable of controlling the speed of single phase terminal fan motors with power factors of between 0.7 and .95 inductive and operating amperage less than 5 amps. The fan speed controller shall be rated for 120 VAC or 277 VAC. The fan speed controller shall bear a UL508 listing.

Control Dampers:

Automatic control dampers shall be Ruskin Model No. RCD46/CD356 or equal and have 16 gauge galvanized steel blades with integral structural reinforcing running full length of the blade. The frame shall consist of 16 gauge galvanized steel. There shall be no blade over 8 inches in width, 48 inches in length, without support, and all damper bearings shall be synthetic type. Blade edge seals shall be EPDM rubber or PVC coated polyester fabric suitable for -25°F to 180°F mechanically locked into the blade edge and jamb seals shall be of the flexible metal compression type. Dampers shall be AMCA certified for leakage not greater than 6 cfm per square foot at a 4 inch w.g. pressure differential (24 inch wide). Modulating dampers shall be opposed blade.

Round control dampers shall be of the butterfly type consisting of a circular blade mounted to a shaft. Inside frame surface shall be clean and smooth with no blade stops or similar inward projections. Frames shall include rolled stiffener beads to allow easy sealing of spiral ductwork joints. Dampers shall include a firm, closed-cell neoprene seal sandwiched between two blades. Leakage through the damper in the closed position shall not exceed 0.15 scfm per inch of blade circumference at a pressure differential of 4" w.g. Leakage through the bearings shall be less than 0.25 cfm at 4" static pressure. Damper frame and blade shall be fabricated from galvanized steel. All parts not protected shall be given one coat of aluminum paint.

All automatic control dampers shall be furnished by the ATC supplier and installed under his supervision by the Contractor as noted in Section 23800.

Damper Actuators:

Damper actuators shall be Belimo or equal. Actuators shall be built for modulating operation with ample power for the service required. All AHU damper actuators and outside air damper actuators shall be spring return unless noted otherwise.

VAV/Reheat Terminal Actuators:

Actuators shall be of the rotary type capable of permanent stall operation without damage. The actuator shall also have adjustable stop for stroke limit. Actuators shall utilize metal housing with nickel steel gears, oil impregnated for lifetime operation, and fit directly over the damper shaft.

Local Controls Panels:

All relays, switches, transducers and other field interface devices, for equipment located within the mechanical equipment rooms, shall be panel mounted. All electrical devices within the panels shall be wired to a numbered terminal strip. All wiring within the panel shall be run in accordance with NEMA and UL standards, and shall meet all local codes. Panels shall be NEMA type suitable for applications as required. Each panel shall have a final as-built control drawing, reduced, laminated and mounted inside of the panel door.

Control Labels:

All temperature control devices in the Mechanical Rooms shall be provided with plastic laminate nameplates indicating their purpose in operation fastened with screws or rivots. Embossed/printed tape labels are not acceptable. This shall include all thermometers, switches, gauges, etc., mounted in the face of the control panels, all control devices mounted inside the control panels, and all miscellaneous control devices mounted remote from the control panels.

Each control panel shall be properly identified to indicate the system or systems which it serves. The corresponding equipment shall also be similarly identified.

Thermostat/Sensor Guards:

Where shown on the Drawings or in vestibules, corridors, toilet rooms and other unsupervised areas, provide sturdy (wire or cast aluminum) thermostat guards. Provide guards with a substantial base plate securely anchored to the wall. Thermostat/sensor access shall be by tamperproof screws or keyed lock. Recessed sensors with flush wall cover plate (flat plate) sensors may be provided in lieu of sensor guards.

Miscellaneous:

The ATC/BAS Contractor shall furnish all electric relays. All electric control devices shall be of a type to meet current, voltage, and switching requirement of their particular application. Relays shall be provided with 24 VAC coils and contacts shall be rated at 10 amps minimum.

Low temperature protection thermostats and high limit duct static pressure switches shall be hard wired to the fan motor starter.

Outdoor pressure reference sensors shall be Dwyer Model No. A306. Install in strict accordance with the manufacturer’s recommended installation instructions.

1.10 APPLICATION SPECIFIC CONTROLLER (ASC) HARDWARE :

General:

The Application Specific Controller(s) (ASC) shall be a stand-alone controller. The controller shall include all hardware and software required for communications with the BAS. An ASC shall be dedicated for each zone terminal device (VAV, Heat Pump, Fan Coil). The ASC is to be mounted remotely from the room sensor.

Programs:

The control program shall reside in the ASC. The application program shall be maintained in ROM. The default database, i.e., setpoints and configuration information, shall be stored in EEPROM, or minimum of 72-hour battery backup shall be provided.

Stand-Alone:

Controllers requiring the application or database to be downloaded from a host or share processing with a "master controller" shall not be acceptable. After a power failure the ASC must run the control application using the current setpoints and configuration.

Communications:

Communication shall be at a minimum of 2400 baud.

Input:

All inputs shall be provided with a calibrate function to eliminate sensing errors.
Output:

Digital output pairs controlling a tri-state motor/transducer or pulse width modulation shall not be utilized for analog control without a matching analog position feedback input.

1.11 VARIABLE FREQUENCY DRIVES:

Variable Frequency Drives (VFD) shall be furnished for the following equipment:

1. **Heating Water Pumps with integral electrical disconnect, without bypass.**
2. **AHU supply fans with integral electrical disconnect, without bypass.**
3. **Relief fans with integral electrical disconnect, without bypass.**

See equipment schedules for motor horsepower requirements. The Contractor shall confirm motor horsepower during shop drawings review. Many of the basis of design AHUs have twin supply and/or return fans, the intent is to operate each set of motors with one VFD (if VFD size allows). The AHU shall come with necessary electrical connections to allow this. Coordinate with the AHU vendor for a complete working system.

Variable Frequency Drives (VFD) shall consisting of a pulse width modulated (PWM) inverter designed for use with a standard NEMA Design B induction motor.

The drive manufacturer shall supply the drive and all necessary options as herein specified. All VFDs installed on this project shall be from the same manufacturer.

Referenced Standards and Guidelines:

1. IEEE 519-1992, Guide for Harmonic Content and Control.
2. UL508(A)(C)
3. UL 61800-5-1
4. ICS 7.0, AC Adjustable Speed Drives
5. EN/IEC 61800-3
6. NEC 430.120, Adjustable-Speed Drive Systems
7. IBC 2012 Seismic – referencing ASC 7-05 and ICC AC-156

VFDs and options shall be UL508 listed as a complete assembly. The base VFD shall be UL listed for 100 kA SCCR without the need for external input fuses.

CE Mark - The base VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2). (RFI / EMI Filter spec).

The entire VFD assembly, including the bypass (if specified above), shall be seismically certified and labeled as such in accordance with the 2012 International Building Code (IBC):

1. VFD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.
2. Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake test data as defined by ICC AC-156.
3. Seismic ratings based upon calculations alone are not acceptable. Certification of Seismic rating must be based on testing done in all three axis of motion by a certified lab.
4. Special seismic certification of equipment and components shall be provided by OSHPD preapproval.

Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.
2. Customer connection and power wiring diagrams.
3. Complete technical product description include a complete list of options provided.

BIM objects shall contain IFC parameters and associated data applicable to building system requirements. These elements shall support the analytic process including size, clearance, location, mounting heights, and system information where applicable.

The VFD package as specified herein shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable).

Environmental operating conditions: -15 to 40° C (5 to 104° F) continuous. Altitude 0 to 3300 feet above sea level, less than 95%, non-condensing. All circuit boards shall be coated to protect against corrosion.

All VFDs shall have the following standard features.

1. Lockable, door interlocked factory mounted electrical disconnect switch.
2. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
3. The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
4. VFDs through 200 HP shall have internal chokes (reactors) providing 5% impedance to reduce the harmonics to the power line and to add protection from AC line transients.
5. The input current rating of the VFD shall not be greater than the output current rating. VFD’s with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.122

6. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.

All VFDs to have the following adjustments:

1. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close.
2. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates.
3. The VFD shall include a fireman's override input. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run at a preset speed or in a separate PID mode.

Serial Communications

The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet).

All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2).

All features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

Bypasses (if specified above) shall be furnished and mounted by the drive manufacturer. All VFDs with bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

1. A complete factory wired and tested bypass system consisting of a door interlocked, padlockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses. UL Listed motor overload protection shall be provided in both drive and bypass modes.
2. The bypass enclosure door and VFD enclosure must be mechanically interlocked such that the disconnecting device must be in the "Off" position before either enclosure may be accessed.
3. The VFD and bypass package shall have a UL listed short circuit current rating (SCCR) of 100,000 Amps and this rating shall be indicated on the UL data label.

4. The bypass shall maintain positive contactor control through the voltage tolerance window of nominal voltage +30%, -35%. This feature is designed to avoid contactor coil failure during brown out / low line conditions and allow for input single phase operation when in the VFD mode. Designs that will not allow input single phase operation in the VFD mode are not acceptable.
5. Motor protection from single phase power conditions - the bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in bypass mode are not acceptable.
6. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed. Bypass systems that do not maintain full functionality with the drive removed are not acceptable.
7. Serial communications – the bypass shall be capable of being monitored and / or controlled via serial communications. On-board communications protocols shall include Modbus RTU; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet MS/TP.
8. The user shall be able to select the text to be displayed on the keypad when an external safety opens. Example text display indications include “FireStat”, “FreezStat”, “Over pressure” and “Low suction”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.
9. Smoke Control Override Mode (Override 1) – The bypass shall include a dedicated digital input that will transfer the motor from VFD mode to Bypass mode upon receipt of a dry contact closure from the Fire / Smoke Control System. The Smoke Control Override Mode action is not programmable and will always function as described in the bypass User’s Manual documentation. In this mode, the system will ignore low priority safeties and acknowledge high priority safeties. All keypad control, serial communications control, and normal customer start / stop control inputs will be disregarded. This Smoke Control Mode shall be designed to meet the intent of UL864/UUKL.
10. Fireman’s Override Mode (Override 2) – the bypass shall include a second, programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above. This programmability allows the user to program the bypass unit to react in whatever manner the local Authority Having Jurisdiction (AHJ) requires. The Override 2 action may be programmed for “Run-to-Destruction”. The user may also force the unit into Override 2 via the serial communications link.

Where required, variable frequency drives shall be UL508C Listed for installation in air plenums.

Installation shall be the responsibility of the Division 23 Contractor.

Power wiring shall be completed by the Division 26 Contractor, to NEC code 430.122 wiring requirements based on the VFD input current.

The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

Factory start-up shall be provided for each drive by a factory authorized service center.

Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US shall be available. Technical support offered only through the local sales office is not acceptable.

The VFD product warranty shall be 24 months from the date of project substantial completion. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.

The Adjustable Frequency Drives shall be Asea Brown Boveri (ABB), Graham, Magnetek, Reliance Electric, Toshiba, Trane, Yaskawa, York or equal.

1.12 APPLICATION SPECIFIC CONTROLLER (ASC) SOFTWARE :

ASC shall have the following minimum capabilities:

A. DDC Control
B. Heating/Cooling Setpoint
C. Occupied & Unoccupied Setpoint Pairs
D. Terminal and Perimeter Hydronic or Electric Heat Control
E. Off-Hours Tenant Override
F. Auto-Calibrate
G. Remote Setpoint Adjust
H. Standby Mode

ASC VAV shall have the following additional capabilities:

A. Dual Minimum, Maximum and Accessory Volume Control

1.13 DIRECT DIGITAL CONTROLLER (DDC) HARDWARE:

General:

The Direct Digital Controllers (DDC) shall be a local control loop microprocessor-based controller installed at each mechanical system; (i.e., air handling units, heating plants, chiller plants, etc.). It shall be acceptable to control more than one system from a DDC as long as there are 25% spare inputs and outputs. Each DDC shall execute local control sequences, independent of a network controller or workstation. All DDC's shall be able to share analog and digital values. All control software and time programs shall be stored in EEPROM or other non-volatile field reprogrammable memory. Controllers with volatile memory shall have a battery for 72 hour database backup. Each controller shall be individually addressable by a system workstation or a portable service tool.

A. The controller network shall be able to handle up to 16 controllers. The controller network shall be true "peer to peer" communication and shall not experience degradation of communication even if any number of controllers go off line due to power loss for example.

B. The controller network shall be able to communicate at a minimum rate of 9600 baud.

C. The controller network shall be able to extend up to 7800 feet, hardwired, without

any communication degradation.

D. The controller network distance shall be able to be extended by using fiber optics or RS232 line drivers.

E. Each controller shall be able to control independently.

F. Controller wiring can be daisy-chained or star configuration connected while allowing the controller network to communicate independently if one controller is disconnected or losses power.

G. Each controller shall have at minimum a 12-bit processor.

H. Each DDC shall have a local communication connector through which a portable computer can be interfaced. The controller shall not have to be removed from the network system in order for this local communication to take place.

Database:

All DDC database shall be entered, changed or downloaded to the general application controllers via a portable service workstation or system workstation.

Input/Output Modules:

Provide the following input/output capabilities:

A. Provide analog inputs which can accept industry standard analog signals such as 4-20 mA, 0-5 VDC, and 0-10 VDC.

B. Provide digital inputs which accept binary contact closures.

C. Digital outputs may be latched or momentary contact type. Digital output pairs controlling a tri-state motor/transducer or pulse width modulation shall not be utilized for analog control without a matching analog position feedback input.

D. Analog outputs shall have a .5% resolution over total output span to 100%.

E. Controller hardware shall be flexible to handle I/O expansions by hardware additions or by being able to download existing control logic into a higher density controller.

F. The analog-digital and the digital-analog conversion shall be accomplished with 12-bit resolution as a minimum.

G. Optional hand/off/auto switches and LED status indication can be provided for inputs and outputs.

Operating Environment:

The DDC shall be capable of operating in an environment of 32 to 122 ˚F and 10 to 90% relative

humidity non-condensing.

Power Loss/Restart:

The DDC shall be tolerant of power failures. When a power failure has occurred and power (normal or emergency) is restored, the BAS shall execute these restart procedures, automatically and without operator intervention:

A. Come online.
B. Update all monitored functions.
C. Implement special building start-up strategies as required.
D. Resume operation based on current time and status.

Peripheral Interface:

BAS shall be able to operate the following peripherals simultaneously.

A. Local on-line System Workstation
B. Dial-in remote System Workstation(s)
C. Local on-line reports and alarm printer
D. Remote dial-out alarm printer

Data integrity:

Data integrity shall be maintained by using cyclic redundancy checking (CRC). In the event of a CRC mismatch, communication shall be automatically retransmitted up to three times. If CRC mismatch continues for three attempts, the failure shall be audibly and visually annunciated on a System Workstation.

1.14 DIRECT DIGITAL CONTROLLER (DDC) SOFTWARE :

General:

Provide complete DDC software to execute all mechanical system local loop controls functions. Each controller type/model shall have the same software functions available. The programming software shall be able to bundle software logic (macroing) to simplify control sequencing. The software shall have the ability to have a clear indication of the control operating mode. All inputs, outputs, output override, setpoints, parameters and calculated values shall have three levels of operator security.

Control Parameters:

The software in the DDC shall produce all of the necessary reverse acting or direct acting, PID signals as required by the control sequence. The proportional integral and derivative values which make up the PID output value shall be readable and modifiable at a workstation or portable service workstation.

Networking:

Each input, output, or calculation result shall be capable of being shared with another controller on

the network and able to pass these values to a higher level system network if necessary.
Control Functions:

Each DDC shall execute local control sequences, independent of a workstation. Control functions shall include but not be limited to the following:

A. Selection of minimum/maximum values
B. Serial Load Staging
C. Binary Load Staging
D. Analog Load Staging
E. Master-Submaster Routines
F. Anti-Windup for Integrated Loops
G. Enthalpy control
H. Energy recovery logic
I. Safety output interlock logic
J. Hysteresis logic to absorb minor instabilities reducing unnecessary output changes.
K. Time or Event Based Scheduling
L. Adaptive Optimum Start/Stop
M. Chiller and Boiler Reset/Optimization
N. Demand Limiting/Load Shedding
O. Tenant/Cost Center Billing
P. Hot Water/Outdoor Air Reset
Q. Run Time Totalization
R. Alarm Detection and Dial Out
S. Night Setback
T. Historical Trending
U. Indoor Air Quality, Demand Ventilation

Alarms:

The DDC shall be capable of comparing analog and digital readings to predetermined high and low limits and enunciate each time a value enters or returns from an alarm condition. The system shall be capable of suppressing selected alarm reporting when the primary equipment from which the alarm point is based in the inactive state. The alarm features of the BAS software shall, as a minimum, provide the following:

A. Digital, Analog, and Hi/Low settings and deadband
B. Sliding Alarm Limits
C. Conditional Alarming
D. Alarm inhibiting through feedback loop
E. Fluttering Alarm Suppression
F. Separate Tailored Alarm Messages of no less than 70 characters each
G. Auto-dial of any alarm condition to a minimum of 10 telephone numbers with a voice message.

Communication Diagnostics:

The DDC software shall be capable of self-diagnosing failure automatically without a query by the operator. In the event of communications failure or limited power failure, the system shall be capable of both notifying a local operator of the specific occurrence, as well as auto dialing the

condition to a remote site. Auto-dial out shall be configurable to repeat the alarm while the situation remains unattended and unacknowledged. In addition to automatic self-diagnostics, communication statistics for the ASC's and DDC's communication
shall be maintained. These statistics shall tabulate total communications attempted versus successful and unsuccessful communications by unit number. The option to reset communication statistics to zero (0) at any time shall be provided.

Trending:

The ATC/BAS shall have the capability to pre-assign trend requirements for all analog or calculated or digital points in the system. Adjustable sampling intervals for each trend, from 1 second to 24 hours, shall be provided. ATC/BAS shall have the capability to simultaneously trend a minimum of 500 combined analog, calculated and digital points. All sampled trend data shall contain an indication(s) of when the data is not valid, whether from sensing or communication disruptions or other causes. Each trend shall be capable of being automatically started or stopped, based on time of day, externally sensed points, alarms, or a calculated value. Printout or upload of trend data to the System Workstation shall be operator-selectable to automatically occur at any time during the sampling period. The software shall allow analog and digital values and calculations to be graphically plotted in real-time or historical format. Uploaded trend data shall be fully compatible with MS-Excel, Lotus 1-2-3, MS-Access.

Control Logic Verification:

The control logic software shall have built-in logic that can be activated on demand to verify logic with digital and analog setpoints that can simulate actual operating conditions.

WEB- BASED OPERATORS INTERFACE:

Web Browser Clients:

The system shall have a web-based operator interface. The system shall be capable of supporting 16 clients using a standard Web browser. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine are only acceptable if 16 licensed copies of the client machine software are provided, installed, and tested.

The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall only be acceptable if 16 workstations or workstation hardware upgrades are provided.

The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, are not be accepted.

1.15 DDC OPERATOR TERMINAL/SERVICE TOOL:

Provide with the ATC/BAS the hardware and software necessary to allow commissioning, adjustment, and diagnosis of the ASC's, and DDC's. All programming shall utilize English language descriptors. A handheld service tool or laptop computer with software shall be

provided.

1.16 REMOTE INTERFACE:

A remote operator shall be able to perform all control functions and all data base generation and modification functions as described for local workstation. ATC/BAS shall have ability to automatically place calls to provide remote alarm indication.

1.17 SYSTEM WORKSTATION HARDWARE:

Provide a system workstation and interconnecting data cables, power cords and surge-suppressing (fused) power strips, as required for a complete Work Station installation.

1.18 SYSTEM WORKSTATION SOFTWARE:

Operating System:

The operating system shall be based on Microsoft Windows. The ATC/BAS shall be capable in future of communicating with other systems using BACnet or LONTALK protocol through a software interface or gateway.

Operators:

Multiple System Workstation operators shall be able to access the system simultaneously. Systems which do not provide multi-tasking, multi-user operating systems are not acceptable.

Graphical User Interface:

Provide a color graphics editor which shall allow the user to generate custom dynamic graphics for graphical representation of system design and system parameters. The graphics editor shall allow zones of the building mechanical systems, floor plans, etc., to be custom generated for the project.

Graphics Creation:

The editing menu shall provide help menus for selecting graphics, choosing colors, copying previous graphics, and selecting data points. A set of standard HVAC symbols shall be provided to allow operators to select from the graphics library for graphic generation.

Display:

Information on the color graphic display shall be dynamic and automatically updated. Dynamic field data, such as analog values and equipment status' shall be displayed on graphics within 1 second of the time the field data is received by the System Workstation.

Decluttering:

The same graphic shall appear in simplified form to a non-sophisticated operator through the use of display suppression called "Decluttering". Decluttering shall allow graphics to be displayed to meet the needs of different operators with different levels of expertise. The level of display

sophistication shall be automatic upon entry of the user's password. All graphic symbols, equipment, lines, etc., shall be assignable to classification groups. Displays shall be capable of being decluttered by individual or multiple classification groups by the operator.

Custom User Symbol Library:

A library of ASHRAE, ISA and logic symbols shall be provided to build the graphics database. It shall be possible to group any collection of symbols so that they may be copied and used repetitively as a group.

The ATC/BAS Contractor shall create and include a graphic diagram for each equipment item included on this project.

Reference Card:

A user reference card shall be provided. The user reference card shall allow the user to create multiple lines of site/system/equipment - specific text information. The reference card shall be invocable by an operator at any time and at any menu option. When invoked, the reference card shall appear on the System Workstation and display specific reference, explanatory, instructional or other information for the current time and menu option position.

Manual Control:

A manual control menu shall be provided, which will allow the operator to turn points on or off, adjust values of control loops, set points to local mode or release points to automatic mode.

Alarms:

Alarm directives shall be provided around the border of the graphic display so as not to impact the display information. The border display shall change color upon the occurrence of an alarm condition. The ATC/BAS shall also have the capability: to display alarm directives in popup windows on workstations, store them on disk, direct them to printers and re-route them based on time of day, day of week, etc. throughout the ATC/BAS network and to different receivers though phonelines and jump to alarm display on graphic. Alarms shall be routed to a workstation based on a combination of alarm priority and alarm class. A minimum of eight alarm priorities shall be available. Alarm classes shall be determined by the user such as HVAC, fire, security, etc. The System Workstation software shall be capability of defining up to 100 alarm classes on the system. Each alarm may be routed to workstation screen, disk file, printer or any combination thereof. The alarm message shall contain appropriate information such as date or value, point description, and a minimum of 80 characters alarm message. If an alarm is routed to a workstation display screen, a pop-up window will be displayed on alarm occurrence with the alarm information in the window. The operator shall be able to acknowledge the alarm with a single keystroke or mouse button depression.

Reporting:

The system shall have the ability to provide status reports for the categories of functions noted below:

A. Name:

All points and point information with the same English name assigned or portion of the same English name assigned.

B. Type:
All points and point information with the type specifications such as analog or digital.

C. Address:
List of ASC and DDCs that are within a specified address range.

D. Status:
All points and point information with a specific status, i.e., all zones in heating, all zones in cooling, all zones unoccupied, or all zones in manual override control.

E. Value:
All points greater to, equal to, or less than a specified value. For example, report on all zones with temperature greater than 76ºF.

Control Summary:

The system shall have the capability to summarize control strategies for any point within the ATC/BAS.
The control summary shall dynamically show all values and point acronyms that make up the control sequence from the input values to the output. These control summaries shall be loggable to a printer for hardcopy.

ASC/DDC Control Configuration:

The operator shall be able to connect directly to a ASC or DDC. Once connected directly to a controller, the operator shall be able to completely configure the controller using a separate window on the workstation. The current configuration of the controller shall be uploaded into the workstation and displayed on the screen. Using menus and prompts the operator shall be able to modify the configuration and re-download the configuration to the connected controller.

ASC/DDC control configurations shall be able to be cloned at the workstation and the same configuration used for other controllers.

Passwords:

The access software shall provide a minimum of 5 levels of passwords. Each level shall be user definable.

1.19 GRAPHICS:

Floor layouts showing rooms and room numbers will be supplied by the school district. By clicking on the Temperature icon, information on the VAV box, AHU, unit heater, etc. serving that area shall be displayed.

The Graphics shall include but will not be limited to the following features:

Home page
Site Plan with link to floors or zones that are color coded to the individual zones. Links to the Chiller and chilled water pumps (CWS), boiler and hot water pumps

(HWS). Link to Power monitoring page. Link to Modes and Schedules. Outdoor air temp with current time and date. Outdoor lighting commandable and schedule

Floor or zone graphic page
Page will show the Room number and room temperature. The link to the associated room equipment, i.e. VAV box, cabinet unit heater, AHU, etc shall be the room number. The exhaust fan icon for the associated will link to an exhaust fan page.

Power Page
Real time Building KW and Voltage power factor. Outdoor air temperature
Link to KW Graph for the last 24 hours and link for last 3 days.
Link to Voltage graph for the last 24 hours and link for the last 3 days.

Equipment pages

VAV boxes:
Day / Night Status
Heat / Cool mode
Room temperature
Room temperature set point
Fan Status with flashing alarm
Htg Vlv Comd
Htg Vlv Set point
Damper position
Damper command
Discharge air temperature
Radiant heat valve
Radiant heat valve comd
CFM Minimum
CFM Maximum
Unoccupied Htg Set point FP boxes only

Unit Heaters or CUH:
/ Night Status
/ Cool mode
Room temperature
Room temperature set point
Fan Status with flashing alarm
Htg Vlv Comd
Htg Vlv Set point
Discharge air temperature
Unoccupied Htg Setpoint

Boiler Page (HWS)
All boiler commands, with status and alarms (flashing). Heating enable set point,

Boiler water supply and return temperatures. HWS reset schedule (adjustable). Boiler leads / lags with indicator as to which boiler is lead commandable. Hot water pump VFD status with adjustable set point Pump lead / lag with indicator as to which pump is lead. Hot water system pressure differential status with adjustable set point. Any changeover valves if applicable with position indicators. Domestic Hot water pump with zone and status and water temperature indication. Combustion air damper with position indication. Outdoor air temperature

AHU page
All AHU's
Economizer set point and status. Outdoor air temperature
Htg valve position and set point commandable
Clg valve position and set point commandable
Mixed damper position and set point commandable
Discharge air temp, with discharge air set point and reset schedule, adjustable
Mixed air temp with mixed air set point, adjustable
Return air temp
Freeze stat status and alarm (flashing)
VFD position and command
Duct pressure, with set point, adjustable
Fan with status, alarm (flashing) commandable
Building pressure status and set point with associated dampers and or exhaust fans.
Smoke damper operation (when applicable
Duct high limit status and alarm (flashing)
CO2 / VOC with adjustable set points
Day / Night or summer status
Morning warm-up mode and set point
Link to Occupied / unoccupied page.

Exhaust Fan Page
All Exhaust Fan
Status and Alarms
Occupied / unoccupied zone and schedule

Notes
All set points to be commandable
All valves pumps dampers, AHUs, Boilers to be commandable under highest password only
All alarms to be flashing
All Valves and dampers 0% to fully closed 100% to be fully open.

SYSTEM ACCEPTANCE:

When the ATC/BAS has been demonstrated to meet the requirements of the Drawings and Specifications the system will be accepted. The warranty period will start at this time.

Operation and Maintenance Manuals:

Submit two (2) copies of operation and maintenance manuals. Include the following in each manual:

A. Manufacturer's catalog data and specifications on all sensors, transmitters, controllers, control valves, damper actuators, gauges, indicators, terminals, and any miscellaneous components used in the system.

B. An Operator's Manual which will include detailed instructions for all operations of the system.

C. An Operator's Reference Table listing the addresses of all connected input points and output points. Settings shall be shown where applicable.

D. A Programmer's Manual which will include all information necessary to perform programming functions.

E. A language manual which will include a detailed description of the language used and all routines used by the system.

F. Flow charts of the software programs utilized in the Control System.

G. Complete program listing file and parameter listing file for all programs.

H. A copy of the warranty.

I. Operating and maintenance cautions and instructions.

J. Recommended spare parts list.

K. After a successful acceptance demonstration, the Contractor shall include record drawings of the completed project for final approval. After receiving final approval, supply three (3) complete record drawing sets, together with Cad diskettes to the owner.

1.20 TRAINING:

BAS manufacturer shall provide to the engineer a training class outline prior to any scheduled training.
Training sessions shall be provided for the Owner's personnel by factory trained control engineers and technicians. The ATC/BAS Contractor shall conduct one (1) eight hour and two (2) four hour training courses for the designated owners' personnel in the maintenance and operation of the control system. One class shall be given upon system acceptance and the others within one year after the warranty commences.

The courses shall include instruction on specific systems and instructions for operating the installed system to include as a minimum:

A. HVAC system overview.
B. Operation of Control System

C. Function of each Component
D. System Operating Procedures
E. Programming Procedures
F. Maintenance Procedures

1.21 WARRANTY:

Warranty:

The entire control system shall be warranted to be free from defects in both material and workmanship for a period of two (2) years of normal use and service.

1.22 TESTING AND ADJUSTING:

The Control Contractor shall furnish a competent individual familiar with the installation to assist the Balancing Company and make the necessary control adjustments as directed by the Balancing Contractor.

1.23 SEQUENCE OF OPERATION:

General:

All setpoints shall be adjustable. Deadband settings shall be used where appropriate to minimize cycling of equipment. Minimum on/off times shall be used where appropriate to minimize cycling of equipment.

Occupied/unoccupied Zones:

The BAS shall provide separate occupied/unoccupied zone signals for each of the following systems:

1. AHU-1

2. Exhaust Fans

3. Recirc Pump

Domestic Hot Water Recirculating Pump:

This Contractor shall provide an interlock with the BAS so that the recirculating pump will cycle from an aquastat set at 120 degrees F. (adj.) during occupied operation and shall be off during unoccupied operation. Temperature indication shall come from a water temperature sensor located in the Domestic water line.

Hot Water Boiler Control with Full Modulation:

Whenever the outdoor air temperature is below 60 deg. F (adj.) or there is a call for heat or reheat, the boiler control sequence will be enabled. The packaged boiler controls shall start the primary hot water circulating pump and, the boiler burner will be energized. The burner

will be modulated from low fire to high fire by the packaged boiler controls as required to maintain setpoints. The BAS shall command the boiler LWT setpoint through a 0-10 vdc signal to the packaged boiler controls. The BAS shall command the boiler LWT to reset according to the reset schedule. The reset schedule shall be fully adjustable from the operator's workstation. When the burner has modulated to the low fire position and the load is such that the water temperature to rise above setpoint, the packaged controller will cycle the burner off.

Each pump shall have a current switch to prove pump operation. If flow is not proven after the pump has been commanded to start, an alarm shall be initiated at the BAS

The BAS Contractor shall provide a hand-off-auto switch for automatic or manual control of the boiler. When the switch is in the automatic position, they shall operate as described above.

The BAS shall tie into the packaged boiler controls for the following: BACnet connection for alarms and set points, 0-10 vdc input for boiler LWT setpoint, Enable/disable the boiler for seasonal control.

Provide a temperature sensor at each boiler for boiler supply and return and system hot water supply and hot water return temperature sensors with remote temperature indication at the operator’s workstation.

The packaged boiler controls shall provide the necessary programming to lead/lag the boilers. The lag boiler shall be enabled if the secondary heating water system temperature set point cannot be maintained for 30 min. (adj.)

Monitor the status of the Emergency Power Off (EPO) switch and provide an alarm at the BAS if either switch is depressed.

Provide control wiring from the boiler to the primary boiler pump starter.

Coordinate installation of the boilers system sensor in the heating loop with the mechanical contractor. Provide all necessary wiring from sensor to boiler control panel.

Hot Water Reset Control:

The BAS shall reset the hot water supply temperature at an inverse ratio to the outside air temperature by cycling the boiler burners and modulating the three-way mixing valve. The reset schedule shall be fully adjustable from the operator's workstation but shall originally be set to maintain the hot water supply temperature as follows:

-15ºF OAT = 180ºF HWS
60ºF OAT = 100ºF HWS

The BAS shall provide an additional control sequence to prevent the water temperature in each boiler from resetting below 140 degrees F. (adj.). If the hot water temperature in any boiler falls below 140 degrees F. (adj.), or the system hot water supply temperature is more than 10 degrees F. (adj.) lower than the BAS reset schedule is calling for, an alarm shall be initiated at the operator's workstation. Provide a temperature sensor in each boiler and

system hot water supply and hot water return temperature sensors with remote temperature indication at the operator's workstation.

Hot Water Heating Pumps:

The lead hot water heating pump shall be started by the BAS during heating operation below 60 degrees F (ADJ.) outside air temperature. The BAS shall modulate the variable frequency drive for the lead pump to maintain the desired system differential pressure according to a differential pressure sensor located as directed by the Engineer. The second pump shall operate if lead pump can't maintain set point.

Each of the two hot water heating pumps shall have a current switch or differential pressure switch to prove pump operation. If flow is not proven after the BAS has commanded the lead pump to start, an alarm shall be initiated at the operator's workstation and the lag pump shall be started and its variable frequency drive shall be modulated by the BAS to maintain the desired system differential pressure. The BAS Contractor shall provide the necessary programming to lead/lag and alternate the pumps.

Fintube Radiation/Hot Water Radiant Ceiling Panels:

The BAS shall maintain the desired space temperature through a DDC controller by modulating a two-way control valve as required. The DDC controllers shall be networked into the BAS to allow for remote adjustments, remote monitoring, and remote temperature indication at the operator's workstation. The DDC controllers shall be Application Specific Controllers (ASC).

Hot Water Cabinet Unit Heaters and Unit Heaters:

The BAS shall maintain the desired space temperature through a DDC controller by cycling the unit fan and two position, two-way control valve upon a call for heat in the space. The BAS shall prevent the fan from operating unless 120 degree F. (adj.) hot water is available. The DDC controllers shall be networked into the BAS to allow for remote adjustments, remote monitoring, and remote temperature indication at the operator's workstation, the DDC controllers shall be Application Specific Controllers (ASC).

Carbon Monoxide Detection:

Provide a Carbon Monoxide (CO) detector in all rooms where natural gas or propane fuel-fired appliances or equipment are located and where shown on the drawings. Provide CO detectors and alarms per Section 915 of the International Fire Code. If CO is detected at a level above an adjustable set point, initiate an alarm locally and at the BAS User Interface. Display the CO ppm level on the graphical user interface.

Equipment Room Exhaust Fans:

A space temperature sensor shall open the intake air damper and start the exhaust fan if the space temperature rises above 80 degrees F. (adj.). Provide a current switch or differential pressure switch across the fan to prove fan operation. If operation is not proven after the BAS has commanded the fan to start, an alarm shall be initiated at the operator's workstation.

Toilet Room Exhaust Fans:

This Contractor shall provide an interlock with the BAS so that the exhaust fans run continuously when their respective zones are in the occupied mode of operation and are off when their zones are in the unoccupied mode of operation. Provide a current switch or differential pressure switch across the fan to prove fan operation. If operation is not proven after the BAS has commanded the fan to start, an alarm shall be initiated at the operator's workstation.

VAV AHU Control:

During occupied operation, the AHU fan shall run continuously as determined by the Building Automation System (BAS). When the occupied cycle of operation is initiated, perimeter FP VAV boxes for the associated AHU (selected by the Owner) shall go to the Occupied mode for an adjustable period of time, before the main fan on the AHU starts. The BAS shall prevent the AHU outside air damper from opening and the heating valve shall open to maintain 100 degrees (adj.) DAT during morning warm-up. When the return air temperature reaches 68 degrees F (adj.), the outside air damper position shall be determined by the IAQ sensor, up to the scheduled required outside airflow.

The BAS shall maintain the desired discharge air temperature by modulating in sequence the outside air and return air dampers, the DX cooling stages and the two-way hot water valve. The BAS shall reset the discharge air temperature from 55 degrees F. to 65 degrees F (adj.) based on space temperature demands. Provide an interlock to prevent the DX cooling from operating until air flow has been proven by a differential pressure or current switch across the AHU fan.

The BAS with its sensor located in the mixed air shall modulate the outside air and return air dampers to prevent the mixed air temperature from falling below 45 degrees F (adj.). The BAS shall return the outside air damper to its minimum position whenever the outside air temperature rises above 75 degrees F (adj.).

The BAS, with its Indoor Air Quality (IAQ) sensor located in the return air, shall override the damper controls as necessary to maintain the minimum and recommended outside air flow rates to obtain acceptable indoor air quality for indoor spaces according to ASHRAE Standard 62, up to the scheduled required outside airflow.

The BAS with its sensor located as directed by the Engineer in the supply air ductwork, shall maintain the supply air static pressure by modulating the adjustable frequency fan drive on the AHU. The BAS shall monitor the VAV terminal damper positions and reset the control pressure setpoint to maintain air flow for the most critical zone.

High limit duct static pressure switches with manual reset located close to the fan in the supply and return air ductwork shall stop the AHU fan, index the system to its unoccupied cycle of operation and send an alarm to the operator's workstation if the duct static pressure exceeds 2.5" W.G. (adj.).

The BAS shall start relief/exhaust fan and open its discharge damper whenever the AHU outside air damper opens beyond its minimum position and the static pressure in the area rises above its setpoint. When the fan has been started, the BAS with its differential pressure sensor located as directed by the Engineer shall maintain the desired positive space static pressure in relation to atmospheric pressure by modulating the adjustable speed fan drive on

relief/exhaust fan.

During unoccupied operation, the AHU fan shall be off and the AHU outside air damper shall be closed. The BAS shall modulate the hot water valve to prevent the mixed air temperature from falling below 45 degrees F (adj.).

Provide a differential pressure sensor across the filters. Whenever the pressure differential across the filters exceeds the setpoint, an alarm shall be initiated at the operator's workstation.

Provide a current switch or differential pressure switch across the AHU fan to prove fan operation. Provide a freeze protection thermostat as previously specified located on the discharge side of the heating coil which will send an alarm to the operator's workstation through the auxiliary contacts, shut off the fan motor, fully close the outside air damper and open the heating coil valve to full flow through the coil whenever the coil outlet air temperature falls below its setting.

Condensing Unit:

Each condensing unit shall be configured for Full Refrigeration Only Controls (ROC) and shall operate in conjunction with a field-installed direct digital control (DDC) system serving the associated air handling unit. The field-installed controls shall provide all application-specific control functions, including cooling demand determination, discharge air temperature regulation, compressor capacity commands, operating schedules, and required system interlocks.

All temperature, humidity, and other sensors required for air handling system operation shall be field furnished, installed, and connected to the field-installed DDC system. The condensing unit shall not require factory-installed application-specific sensors or building automation network integration.

The field-installed DDC system shall provide a modulating 0–10 VDC analog signal to the condensing unit's MicroTech® refrigeration controller for compressor cooling capacity control. The signal shall represent the requested cooling capacity from minimum to maximum output. A separate cooling enable contact shall be provided and interlocked with the associated air handling unit's operation and required safety conditions. The factory-installed refrigeration controller shall remain responsible for compressor modulation, staging, and internal refrigeration system protection.

The field-installed DDC system shall provide all necessary control wiring and connections between the condensing unit and associated air handling unit, including cooling enable, capacity modulation, and applicable operating status and alarm monitoring. All field control wiring and sequences shall be coordinated with the manufacturer's published installation and operation instructions and project-specific wiring diagrams.

Fan Powered VAV Terminals with Hot Water Reheat:

The BAS shall control the fan powered VAV terminals through DDC Application Specific Controllers (ASC). The DDC controllers shall be networked into the BAS and shall provide remote adjustments, remote monitoring, remote terminal discharge temperature and remote space temperature indication at the operator's workstation. Provide a discharge air sensor downstream of the heating coil to monitor leaving air temperature.

During occupied operation, the ASC shall control the variable air volume terminal unit to maintain the desired space temperature. The ASC shall modulate the supply air damper and fan to maintain constant cfm, and three-way reheat coil valve as required to maintain the heating or cooling setpoint. The supply air volume will be limited by the minimum and maximum heating and cooling air volume settings. The supply air damper shall maintain the minimum air volume setting when the space temperature is below the cooling setpoint. The reheat coil valve shall not open until the space temperature has dropped below the heating setpoint. When commanded by the BAS to change over to the unoccupied mode, the ASC shall raise the cooling setpoint and decrease the heating setpoint as appropriate to operator determined values.

During unoccupied operation, the VAV terminal fan shall be off and the supply air damper shall be closed. The ASC shall maintain the space at its reduced unoccupied temperature setting by cycling the VAV terminal fan on with the reheat coil valve open upon a call for heating in the space. The ASC shall be reset to occupied operation for an operator determined time period by activating a local override switch located on the space temperature sensor.

All fan-powered VAV terminal fans shall be stopped by the ATC/BAS when a general fire alarm is received from the fire alarm system. This Contractor shall obtain the signal from the fire alarm panel.

VAV Terminals with Hot Water Reheat:

The BAS shall control the VAV terminals through DDC Application Specific Controllers (ASC). The DDC controllers shall be networked into the BAS and shall provide remote adjustments, remote monitoring, remote terminal discharge temperature and remote space temperature indication at the operator's workstation. Provide a discharge air sensor downstream of the heating coil to monitor leaving air temperature.

During occupied operation, the ASC shall control the variable air volume terminal unit to maintain the desired space temperature. The ASC shall modulate the supply air damper and two-way reheat coil valve as required to maintain the heating or cooling setpoint. The supply air volume will be limited by the minimum and maximum heating and cooling air volume settings. The reheat coil valve shall not open until the space temperature has dropped below the heating setpoint. When heating water is available, the reheat valve approaches full open and the heating requirements continues to increase, the heating cfm shall be modulated open to the scheduled heating cfm. When commanded by the BAS to change over to the unoccupied mode, the ASC shall raise the cooling setpoint and decrease the heating setpoint as appropriate to operator determined values.

Refrigerant Detection:

The air handling unit shall be furnished with an A2L refrigerant detection control panel, refrigerant sensor(s), and mitigation dry contacts as specified under the air handling unit equipment requirements. The field-installed controls contractor shall provide the necessary wiring and control coordination between the air handling unit's refrigerant detection system and the DCSA condensing unit's factory-provided Emergency Off circuit. Upon detection of a refrigerant leak, the system shall initiate the required air handling unit leak mitigation

sequence and disable compressor operation at the associated condensing unit. Field connections shall be made at the manufacturer's designated A2L refrigerant detection/emergency shutdown terminals in accordance with the unit-specific wiring diagrams and manufacturer's installation instructions. The required shutdown and mitigation sequence shall be verified during controls system startup and checkout. Upon detection of a refrigerant leak, the condensing shall be commanded off, the vav terminal units supply air dampers shall open, and the ahu fan shall be started for the scheduled cfm flow.

Point Trending: These points need to be set up for trending and through a link shall be shown in graph form. Trending shall be in 15 minute intervals and have 48 hours (min.) of data.

FP VAVs and VAV

1. Room Temp
2. Discharge Air Temp
3. Air Flow

Unit Heaters, Cabinet Unit Heaters and Radiation

1. Room Temp

AHUs

1. Discharge Air Temp
2. Mixed Air Temp
3. Duct Static
4. VFD position
5. Fan Command
6. Zone Temperature

Hot Water

1. Hot water supply temp
2. Hot water return temp
3. Hot water pressure differential
4. Domestic Hot water temperature
5. Outdoor air temp

AHU inlet and Outlet Static Pressure Limit Control:

High limit duct static pressure switches with manual reset located close to the fan in the supply and return air ductwork shall stop the AHU fan, index the system to its unoccupied cycle of operation and send an alarm to the operator's workstation if the duct static pressure exceeds 2.5" W.G. (adj.).

END OF SECTION 230900

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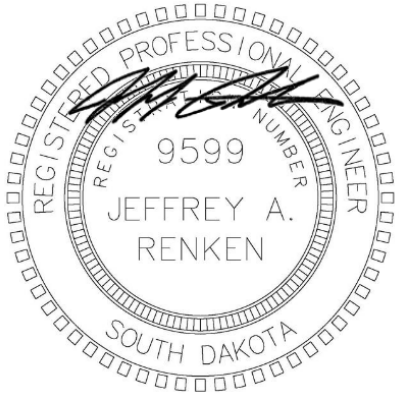
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PROJECT: HARRISBURG CITY HALL
HARRISBURG, SOUTH DAKOTA

ACEI PROJECT NO.: 126029

DATE: November 12, 2026



Project Manual sections prepared by or under the supervision of Jeffrey A. Renken, Reg. No.9599, include all sections of Division 26-27-28.

SECTION 260100 – COMMON ELECTRICAL REQUIREMENTS

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. In certain instances where the terms of this Division of the Specifications conflict with the terms of the General Conditions, or Special Conditions, this Division of the Specifications shall govern.

B. Note that the complete electrical installation for this project falls under three specification divisions: Division 26, Division 27, and Division 28.

C. The project shall be bid as one complete package with the final electrical construction bid containing all costs for Divisions 26, 27, and 28.

D. The general requirements shown here in this Division 26 section shall also apply to Divisions 27 and 28.

E. Where M.C. or Mechanical Contractor is referenced in Division 26, 27, or 28 specifications or on the electrical drawings, it refers to the general trade. Coordinate in field with the proper Fire Suppression, Plumbing, or HVAC Contractor based on the information in the specification or note.

1.2 SUMMARY

A. This Section shall include everything in Divisions 26, 27, and 28 of the Specifications and everything indicated on the Drawings that are complementary to these Divisions of the Specifications. Refer to the Index of Drawings to determine what Drawings apply directly to this section.

B. Where “Contractor” is referred to in this Division of the Specifications it shall mean Contractor and/or Sub-Contractors responsible for all or any part of the electrical installation specified in Divisions 26, 27, and 28 and/or as shown on the Contract Drawings.

C. Where the specifications in subsequent Sections of Divisions 26, 27, or 28 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

D. The contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring, and incidents necessary to be installed in accordance with manufacturer’s recommendations except as otherwise approved.

1.3 INTENT OF PLANS AND SPECIFICATIONS

A. The intent of the plans and specifications are for the complete installation of the system described so that at the conclusion of the construction, the systems will be turned over to the owner complete and ready for safe and efficient operation. The plans and specifications cannot

deal individually with the many incidental items which may be required by the nature of the systems. The contractor shall be obliged to furnish and install all such items normally included on systems of this type, which while not mentioned directly in the drawings and specifications are obviously essential to the installation and operation of the system and which are normally furnished on quality installations of this type.

B. The contractor shall make a thorough inspection of the conditions and be familiar with all conditions affecting the extent and cost of this work. Claims for extra payments as a result of failing to examine the conditions will not be allowed.

1.4 PERMITS AND SERVICE CHARGES

A. All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

B. All work shall be executed in accordance with all local, state, and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.5 CODES AND STANDARDS

A. All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.
   1. Local and State Codes, Standards, and Regulations.
   2. NFPA 70, National Electrical Code, Current Addition.
   3. National Board of Fire Underwriters (NBFU).
   4. National Electrical Manufacturers Association (NEMA).
   5. Underwriters Laboratories (UL).
   6. Electrical Testing Laboratory (ETL).
   7. Illuminating Engineering Society (IES).
   8. American National Standards Institute (ANSI).
   9. National Fire Protection Association (NFPA).
   10. International Building Code (IBC).
   11. International Fire Code (IFC).

B. Compliance:
   1. Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation. Contractors shall familiarize themselves with local codes and regulations which affect their work in any way. Extra payment will not be allowed for changes required by local codes and regulations.
   2. All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.6 DRAWINGS AND MEASUREMENTS

A. In general, the Drawings of the electrical systems and equipment are to scale. However, to determine the exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

B. Drawings of fixtures and devices, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

1. Install light fixtures and wiring devices at heights specified in the Electrical Symbol Legend or as shown on the drawings. All measurements are to center unless noted otherwise. Device heights indicated on architectural elevations shall take precedence over symbol legend.

C. Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in conduit, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

D. Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the systems are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

E. The Contractor, Subcontractor's and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.7 SUBSTITUTIONS AND PRODUCT OPTIONS

A. The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

B. Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

C. Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least seven days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

D. Whenever an item of material or equipment is identified on the drawings or specifications by reference to brand name or catalog number, it shall be understood that the reference is made for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality, or function may be considered.

E. The listing of any manufacturer preceded by the phrase “or equal by” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any price quotations received, and submittals made are for products which meet or exceed the specifications included herein. The Contractor must judge that such items of substitution are of equal quality and character to the specified items and it is physically adaptable for installation within the allotted space with all required service clearances. The cost of any changes to other trades as a result of use of the substitution material or equipment must be borne by the Contractor submitting such material or equipment.

F. Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with full descriptive and technical data for the proposed item with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

G. After the award of the Contract, any request for a substitution must be made in writing by the Contractor (not the material supplier or subcontractor). Such request shall state the name of the product specified, the name of the product proposed for substitution, the reason for requesting the substitution, and any change to the Contract amount resulting from the substitution. No such substitution shall be made until an appropriate Contract modification has been issued and approved.

1.8 SUBMITTALS

A. Schedule of Materials and Equipment:
   1. The Contractor shall submit a complete list of proposed equipment manufacturers for major systems and a list of Sub-Contractors, for the Engineer’s review. This list shall be submitted for review within 15 days after the contract has been awarded and before ordering any material or equipment.
      a. Review of the list shall in no way relieve the Contractor from the responsibility of submitting complete shop drawings nor shall it constitute approval should the shop drawings be found to be partially or completely not in full compliance with the specification requirements.

B. Schedule of Values:
   1. The Contractor shall submit an itemized schedule of values for the various portions of the work, including separation of labor and materials for each item, to the Engineer before submission of the first Request for Payment. The schedule of values shall be divided so as to facilitate the Engineer’s analysis of the various costs for the purpose of approval of

the payment requests. The submittal shall meet the approval of the Engineer before any progress payment will be provided. The following are required categories for the cost breakdown.

a. Service and Distribution Equipment.
b. Lighting.
c. Wiring Devices.
d. Equipment Connections.
e. Basic Materials.
f. Special Systems.

C. Shop Drawings:

1. Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors. Furnish Shop Drawings as follows:
   a. For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.
   b. For all equipment, systems or devices where Shop Drawings are specifically called for.
   c. For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.
   d. Shop drawings shall include manufacturer, catalog number, voltage and current characteristics, wire sizes, construction, and rough-in data of all materials to be used. Each product data sheet shall clearly indicate the proposed product.
2. The Contractor shall check all Shop Drawing submittals for compliance with Contract Documents, for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.
   a. Each shop drawing shall be certified as being checked and approved by the Contractor before submittal. Shop drawings not indicated as being approved by the Contractor will be returned without review.
3. Shop Drawings will be reviewed by the Architect/Engineer, and copies of Shop Drawings will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.
4. Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages that may be incurred to the structure as a result of the above correction shall be paid by this Contractor.
5. Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.
6. The Contractor shall maintain two (2) copies of approved shop drawings to be submitted with the Operating and Maintenance Manuals.

1.9 QUALITY ASSURANCE

A. Materials and equipment shall be new and of the best quality, of the type best suited for the purpose intended, and be made by nationally recognized and substantially established manufacturers. The type and weight of material used for each purpose shall be as herein specified, and material shall conform to the requirements of the latest standard specifications of the "ASTM" for that particular material.

B. All materials and equipment shall be listed, labeled, or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., standards where test standards have been established.
   1. Equipment and materials which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified, or otherwise determined to meet safety requirements of a nationally recognized testing laboratory.
   2. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

C. The installation work included in this specification shall be performed in a neat workmanlike manner by persons experienced and skilled in the Electrical trade. Only the best quality workmanship will be accepted. All exposed parts of the electrical wiring systems such as exposed conduits, flush plates, cabinet trims, fixtures, etc., shall be square and true with the building construction.

1.10 COORDINATION OF WORK

A. The Mechanical and Electrical Contractors and their Subcontractors shall have coordination meetings to coordinate electrical connection requirements for mechanical equipment and facilitate the installation of equipment, ducts, pipes, electrical panels and equipment, and other miscellaneous equipment. The Mechanical Contractor and Electrical Contractor shall coordinate the location of all equipment during the coordination meetings to prevent interferences between equipment of different systems. Any conflicts that may be discovered during the coordination meetings shall be brought to the immediate attention of the Engineer.

B. The Contractor shall order equipment and materials in a timely manner and shall be responsible for close correlation of the work with that of all other Contractors on this project so that it will not interfere with or delay the work of other Contractors. The Contractor shall confer and cooperate with all other Contractors on this project and shall arrange the work in proper relation to the work of others.

1.11 RECORD DRAWINGS AND OPERATING AND MAINTENANCE MANUALS

A. Record Drawings:
   1. The Contractor shall keep a complete set of all electrical drawings in the jobsite office for the purpose of showing the installation of electrical systems and equipment. This set of drawings shall be used for no other purpose. Where any materials equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall be clearly and neatly shown on this set of drawings using ink or

indelible pencil. At the completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property.

a. Incorporate all changes made by addendum, shop drawing review, change order, and field orders.

B. Operating and Maintenance Manuals:

1. The Contractor shall furnish the Owner with two (2) sets of complete catalog data (approved shop drawings), manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division.
   a. Comply with Division 1 requirements.
   b. The manual shall indicate the Contractor's name, address, and phone number and include a list of all Subcontractors, including company name, address, and telephone number.
   c. The manual shall include, but not be limited to, the following: Installation instructions; maintenance and overhaul instructions; procedures for start, operation, and shut down of equipment and systems; complete wiring and control diagrams; cleaning of lighting fixtures lenses and other equipment; safety precautions; diagrams and illustrations; manufacturers' name and catalog data; test procedures; name and address of authorized service organizations; and parts distributor for all material and equipment installed. Include all special warranty statements for all special warranties required by contract documents.
   d. The manual shall include a complete inventory list of all extra materials which are specified to be provided in the Contract.
   e. All such literature shall be bound in an amply sized three-ring binder with table of contents and tabbed sections separating and identifying the sections of the manual.
2. The Contractor shall supervise the initial operation of all equipment and instruct the Owner's designated operator or maintenance representative in such operation as to acquaint the operator thoroughly with the equipment.

C. Testing:

1. Work which is required to be placed within the construction or concealed shall be carefully tested and inspected before being permanently concealed.
2. The Contractor shall provide all testing instruments, equipment, and all materials, connections, labor, etc., required to perform tests.
3. Test all circuits, fixtures, equipment, and systems for proper operation and freedom from grounds, shorts, and open circuits before acceptance is requested.
4. Provide complete operational sequence checkout to verify all modes of operation both normal and alarm for each system. Test all control systems that interact with each other as a complete system to demonstrate that all interconnections and interactions are correct and that all interconnect wiring is functional.
5. Perform all tests required by local authorities, such as tests of life safety systems, in addition to tests specified herein. Perform tests required by other specification sections.
6. Tests shall be made in the presence of the Engineer and the Owner, and shall meet with their approval. The Contractor shall notify the Engineer at a time sufficiently prior to the performance of any test to allow time for the engineer to be present for the test.
7. The entire system shall be subject to a test at full operation and under normal usage conditions. This shall include voltage and current checks, resistance measurements, and equipment operation. Failure of any phase of system operation shall constitute failure of the system. Correct failures and retest system. Repeat until the system is operating to required specifications.
   a. Submit dated "Electrical System Test Reports" indicating all tests performed and demonstrating conformance with the required system performance criteria in tabular form.

8. After testing the apparatus, the entire system shall be operated for one week under normal conditions.
9. The final testing shall be performed as soon as possible after the work is entirely completed.

1.12 FINAL INSPECTION

A. Upon completion of the work, the Contractor shall notify the Architect and/or Engineer and make arrangements for a final inspection. The Contractor shall submit the operation and maintenance manuals prior to the final inspection; the Engineer will not schedule nor perform a final inspection without successful submittal of operating and maintenance manuals by the Contractor.
   1. During the final inspection and subsequent follow-up final inspection, the Contractor and all major Sub-Contractors shall have the foreman of the project present.

B. After the Engineer's final inspection is made, the Contractor will receive a list of items requiring adjustment, correction, replacement, or completion.

C. The Contractor shall comply completely with all the listed requirements within thirty (30) days of receipt of the list. Should the Contractor fail to perform within this time limit, the Owner reserves the right to have the work completed by others and the cost deducted from the contract price.

D. The Contractor shall notify the Architect and/or Engineer once all listed requirements are completed, that the Contractor is ready for a follow-up final inspection. The written notice shall contain explanations for those known items not completed and a schedule for completing them.

E. The Architect and/or Engineer shall schedule a follow-up final inspection to confirm completion of all listed requirements. Repeated inspection trips required of the Engineer due to the Contractor's inability to complete the project satisfactorily will require the Contractor to reimburse the engineer for all incurred costs after the follow-up final inspection.

1.13 GUARANTEE

A. The Contractor shall assume responsibility for any defects which may develop in any part of his work caused by faulty workmanship, material or equipment, and agrees to replace, repair, or alter, at the Contractors expense, any such faulty workmanship, material, or equipment that has been brought to the Contractors attention during a period of one year from the date of the final certificate for payment. Acceptance of the work shall not waive this guarantee.
   1. Refer to Divisions 26, 27, and 28 Specifications for additional special equipment warranties.

END OF SECTION 260100

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

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. In certain instances where the terms of this Division of the Specifications conflict with the terms of the General Conditions, or Special Conditions, this Division of the Specifications shall govern.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Electricity-metering components.
4. Concrete equipment bases.
5. Firestopping
6. Cutting and patching for electrical construction.
7. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: Include manufacturer product data sheets for underground warning tape, electric metering equipment, and firestopping materials to be utilized on this project.

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.

1.6 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers. Wire hangers shall not be utilized for supporting raceway or boxes (except for supporting raceways installed within steel stud walls where raceways are supported from the studs).

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.2 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).

C. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend that indicates type of underground line.

D. Tape Markers for Wire and Cables: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

H. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm), galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch (6-mm) grommets in corners for mounting.

I. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

2.4 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.5 FIRESTOPPING

A. Conduit, cable penetrations, and any other electrical equipment penetrations of fire rated construction, equipment rooms, and/or where designated on the Drawings shall be sealed with a fire retardant sealant similar to:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant.
2. STI SpecSeal Series LCI Intumescent Sealant.
3. STI SpecSeal Series SST Firestop Putty.
4. STI SpecSeal Series SSB Firestop Pillows.
5. STI Pensil 200 Silicone Foam.
6. STI EZ-PATH Fire Rated Pathway or Hilti Speed Sleeve.

B. Fire sealants shall be Specified Technologies, Inc., 3M Fire Protection Products, A/D Fire Protection Systems, Inc., Hilti Inc., Nelson Firestop Products, or equal.

1. Firestopping materials shall be low VOC.

C. Obtain through-penetration firestop systems from a single manufacturer with experienced installers having the necessary experience, staff, and training to install manufacturer’s products per project requirements.

2.6 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. The installation shall be in accordance with the latest requirements of the NEC, State, and Local Codes, ordinances and regulations of any other governing body having jurisdiction

B. All equipment shall be installed in a neat and workmanlike manner and to the satisfaction of the Project Engineer.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

D. Equipment Rooms: Line walls where electrical equipment is to be mounted with ¾" plywood backboards. Paint backboards with two coats of low VOC gray fire retardant paint.
   1. Where equipment is installed in rooms being used as return air plenums, electrical equipment shall be mounted to Hoover Treated Wood Products Pyro-Guard backboards.

E. Mount panelboards, contactors, and other electrical equipment on backboards, unless otherwise indicated.

F. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

G. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

H. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

   1. Wire hangers are not an acceptable support component for supporting raceways and boxes (except for supporting raceways installed within steel stud walls where raceways are supported from the studs).

2. Raceways and boxes shall be rigidly fastened and supported. Aircraft cable hanging systems (gripple hangers) are not acceptable.
3. Nothing shall rest on, or depend for support on, suspended ceilings (tiles, lath, plaster, as well as splines, runners, bars, and the like in the plane of the ceiling).
4. Support raceways at intervals no greater than ten feet and with one support within three feet of each coupling, box, fitting, or outlet box. Provide one support within three feet of each elbow or bend.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying. Self adhesive identification products are not approved for electrical equipment enclosure labels.

D. Tag and label circuits. Identify source and circuit numbers in each cabinet, pull and junction box, and receptacle outlet box. Color-coding may be used for voltage and phase identification. Neatly mark junction box covers (outside of box where concealed in building finishes or in unfinished spaces, inside of box in finished public spaces) with voltage, source and circuit numbers with permanent black marker.
    1. Feeder and Power Circuit Identification: Use plasticized card stock for cables, feeders, and power circuits in pull boxes and electrical rooms.
        a. Legend: ¼" steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
        b. Fasten tags with nylon cable ties, fasten bands using integral ears.
    2. Apply identification to conductors as follows:
        a. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
        b. Multiple Control or Communications Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color coding, or cable marking type.

E. Equipment Identification: Apply equipment identification labels of engraved plastic laminate on each major piece of equipment. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Provide labels for the following types of equipment.
    1. Switchboards, distribution panels, panelboards, and electrical enclosures.
    2. Access doors and panels for concealed electrical items.
    3. Enclosed controllers, indicate which motor or piece of equipment the unit is serving.
    4. Enclosed switches and circuit breakers, indicate which motor or piece of equipment the unit is serving.

5. Service Equipment: Service equipment in other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault current calculation was performed.
6. Lighting control panels and contactors.
7. Transformers.
8. Fire alarm control panel.
9. Paging Intercom and Sound system equipment racks.

F. Install continuous underground warning tape during trench backfilling, for exterior underground power, control, signal, and communication lines, locate marker directly above power and communication lines. Locate approximately 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.

H. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

I. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 2 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

B. The Electrical Contractor shall size and provide the concrete and installation associated with the following items as called out elsewhere in the plans and specifications:

1. Utility Transformer Pad.
2. Light Pole Bases.
3. Exterior Grade Mounted Light Fixtures.

C. Provide “house keeping pads” for all floor mounted electrical components, including transformers, switchboards, distribution boards, and motor controls centers. Pads shall be a minimum of 4” thick and comply with parts 2 and 3 of this specification section.

3.7 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Electricity-metering components.
4. Concrete bases.
5. Firestopping materials.
6. Cutting and patching for electrical construction.
7. Touchup painting.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260500

SECTION 260573 – ARC FLASH HAZARD ANALYSIS/SHORT-CIRCUIT/COORDINATION STUDY

PART 1 GENERAL

1.01 SCOPE

A. The contractor shall furnish short-circuit and protective device coordination studies as prepared by a Professional Engineer.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E -*Standard for Electrical Safety in the Workplace*. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2002, the IEEE *Guide for Performing Arc-Flash Calculations.*

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract.

1.03 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
6. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

C. The National Fire Protection Association (NFPA)

1. NFPA 70 -National Electrical Code, latest edition
2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.04 SUBMITTALS FOR REVIEW/APPROVAL

A. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

1.05 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. Electronic PDF copies of the report shall be provided. A minimum of three (3) bound copies of the complete final report shall also be submitted.

B. The report shall include the following sections:

1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
2. Short-Circuit Methodology Analysis Results and Recommendations
3. Short-Circuit Device Evaluation Table
4. Protective Device Coordination Methodology Analysis Results and Recommendations
5. Protective Device Settings Table
6. Time-Current Coordination Graphs and Recommendations
7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.
10. Mechanical equipment with compressors.
11. Elevator equipment, where applicable.

1.06 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the equipment manufacturer or an approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.

E. The engineering firm shall have a minimum of twenty-five (25) years experience in performing power system studies.

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program.

PART 2 PRODUCT

2.01 STUDIES

A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies. All studies to be prepared by a Professional Engineer.

2.02 DATA

A. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future motors and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.

D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
4. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.

5. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
3. The preparer shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
6. Medium voltage conductor damage curves
7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.
11. Mechanical equipment with compressor loads.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Professional Engineer shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.05 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04)

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 5 cycles.

H. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

L. Provide the following:

1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. The Professional Engineer shall notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH LABELS

A. The Professional Engineer shall provide a 4.0 in. x 4.0 in. Brady thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:

1. UL969 – Standard for Marking and Labeling Systems
2. ANSI Z535.4 – Product Safety Signs and Labels
3. NFPA 70 (National Electric Code) – Article 110.16

C. The label shall include the following information:

1. System Voltage
2. Flash protection boundary
3. Personal Protective Equipment category
4. Arc Flash Incident energy value (cal/cm^2)
5. Limited, restricted, and prohibited Approach Boundaries
6. Study report number and issue date

D. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:

1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment – Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

E. Labels shall be field installed by electrical contractor. The technician providing the installation shall have completed an 2-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

3.03 ARC FLASH TRAINING

A. The vendor supplying the Arc Flash Hazard Analysis shall train the owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent. The trainer shall be an authorized OSHA Outreach instructor.

B. The vendor supplying the Arc Flash Hazard Analysis shall offer instructor led and online NFPA 70E training classes.

END OF SECTION

SECTION 260600 - GROUNDING AND BONDING

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 grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 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. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Chance/Hubbell.
b. Copperweld Corp.
c. Erico Inc.; Electrical Products Group.
d. ILSCO.
e. O-Z/Gedney Co.; a business of the EGS Electrical Group.
f. Panduit.
g. Raco, Inc.; Division of Hubbell.
h. Superior Grounding Systems, Inc.
i. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Grounding Electrode Conductors: Stranded copper cable, #4 AWG minimum.

D. Underground Conductors: Bare, tinned, stranded copper, unless otherwise indicated.

E. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

F. Copper Bonding Conductors: As follows:

1. Bonding Cable: Minimum size of 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: Minimum size of No. 6AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; minimum size of 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Compression Direct Burial Grounding System:
1. Must comply with the industry requirements of IEEE standard 837. The fully inspectable system that is UL467 listed and CSA 22.2 certified.
2. Comply with vibration tests per MIL-STD-202G (method 201A).
3. Pre-applied conductive antioxidant compound ensuring a high quality mechanical and electrical bond.
4. Slotted tap design and locator die to ensure crimp quality.
5. Panduit GCE, GCC, GUBC, GPC4H compression grounding connector series and Panduit CD-930G-1/O, CD-930G-250, CD-930G-500 dies.

D. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 5/8 by 120 inches.

PART 3 - EXECUTION

3.1 APPLICATION

A. Multiple Disconnecting Means Enclosures: Comply with NEC article 250.64(D).

B. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

C. In raceways, use insulated equipment grounding conductors.

D. Exothermic-Welded or Compression Grounding System Connections: Use for connections to structural steel and for underground connections, except those at test wells.

E. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

G. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits.

1. Bond the grounding conductor to each pullbox, junction box, outlet box, cabinets, and other enclosure through which the ground conductor passes.

C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide #3/O insulated grounding conductor in raceway from grounding electrode system to the main distribution frame (MDF) location and #6 AWG insulated grounding conductor from the MDF to intermediate distribution frame (IDF) locations in a loop configuration. Bond the grounding bus at the MDF and IDF locations to structural steel, the nearest panelboard, and all telecommunications equipment racks. See the Telecommunications Grounding Detail on the drawings.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Ground Rods: 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.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Electrical Utility Service: Provide grounding and bonding at Utility Company’s metering equipment and pad-mounted transformer in accordance with Utility Company’s requirements.

E. Metal Water Service Pipe: Provide 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 by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

F. Water Meter and Filter Piping: Use braided-type bonding jumpers to electrically bypass water meters, filters or other serviceable equipment. Connect to pipe with grounding clamp connectors.

G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

H. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

I. Bond metal water piping systems in accordance with NEC Article 250.104.

J. Bond the grounding electrode system to the structural steel of building, if any, using exothermic weld. Coordinate work with the General Contractor.

K. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NEC Article 250, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. 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 a grounding electrode external to concrete. Coordinate work with the General Contractor.

L. See grounding detail on the drawings.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact. Remove all point from points of contact prior to making connections.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Pad-Mounted Transformers and Switches: Install four ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 1/O AWG (minimum) for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches (450 mm) below grade and 6 inches (150 mm) from the foundation. Coordinate with electrical utility requirements.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Measure ground resistance from the system neutral connection at the service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 5 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 32 Section "Turf and Grasses." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 260600

SECTION 261200 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600V and less.

1.3 SUBMITTALS

A. Product Data: For heat trace cables and controls.

B. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wires and Cables:

a. American Insulated Wire Corp.; Leviton Manufacturing Co.
b. BICC Brand-Rex Company.
c. Kingwire, Inc.
d. Southwire Company.
e. Encore Wire.

2. Connectors for Wires and Cables:

a. AMP Incorporated.
b. General Signal; O-Z/Gedney Unit.
c. Square D Co.; Anderson.
d. 3M Company; Electrical Products Division.
e. Arlington Fittings.
f. Bridgeport Fittings.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Thermoplastic Insulation Material: Comply with UL 83 and NEMA WC-70 (ICEA S-95-658).

C. Cross-Linked Polyethylene Insulation Material: Comply with UL 44 and NEMA WC-70 (ICEA S-95-658).

D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC-70 (ICEA S-95-658).

E. Conductor Material: Copper, except feeders and services larger than 80 amps may be aluminum AA-8000.

1. Verify with mechanical contractor if aluminum conductors can be utilized for connections to mechanical equipment. Utilize copper conductors where required.

F. Stranding: Solid conductor for No. 12 AWG and smaller; stranded conductor for No. 8 AWG and larger. No. 10 AWG to be either solid or stranded (contractor’s option).

2.3 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

B. All branch circuit wiring connections shall be made using wire nut connectors which provide direct wire to wire contact. Connectors which utilize insulation displacement, intermediate metal or spring compression connection are not acceptable.

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.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type XHHW-2 or THWN-2, in raceway.

B. Feeders: Type THHN/THWN-2, in raceway.

C. Branch Circuits: Type THHN/THWN-2, in raceway.

D. Branch Circuits: Type MC, 90C insulation, steel corrugated or interlocked sheath with insulated equipment grounding conductor.

E. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable, in raceway.

F. Fire Alarm Circuits: Type THHN/THWN-2, in raceway.

G. Class 1 Control Circuits: Type THHN/THWN-2, in raceway.

H. Class 2 Control Circuits: Power-limited cable, concealed in building finishes or in raceway where installed exposed in finished public spaces.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Unless otherwise noted or shown on the drawings, a maximum of three circuits (three phase conductors, neutrals, and ground) shall be allowed in a single home run raceway.

C. Multiwire Branch Circuits: Sharing of neutrals is not allowed, provided dedicated neutral for each branch circuit.

D. Wire size on 120 volt, 20 ampere branch circuit home run conductors over 75 feet in length (from the closest wiring device at the home run designation to the associated panelboard shown on the electrical drawing sheets), shall be increased to No. 10 AWG (minimum) to limit excessive voltage drop.

E. All corridor lighting branch circuits shall be increased to No. 10 AWG (minimum) through-out to limit excessive voltage drop.

F. All exterior lighting branch circuits shall be increased to No. 10 AWG (minimum) through-out to limit excessive voltage drop.

G. All lighting branch circuit home run conductors shall be increased to No. 10 AWG (minimum) (from the last light fixture at the home run designation shown on the electrical drawing sheets to the associated panelboard) to limit excessive voltage drop.

H. Pull Conductors: 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.

I. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

J. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

K. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

L. Seal around cables penetrating fire-rated elements according to 260500 and Division 7 Section "Firestopping."

M. Identify wires and cables according to Division 26 Section "Basic Electrical Materials and Methods."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Wiring at Outlets: Install pigtail conductor at each outlet, with at least 8 inches of slack. Where multiple sets of conductors enter a box, provide 8” pigtails to devices and make connections such that the continuity of the branch circuit conductors is not dependent upon device connections and the continuing load is not routed through the device. All unused device terminal screws shall be turned completely in, provide two full wraps of electrical tape around all device terminals. On 20 amp circuits where #10 AWG conductors are required for home runs, provide #12 AWG solid pigtails for connection to device.

E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection test stated in NETA ATS, Section 7.3.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.6 STARTUP SERVICE

A. Verify that heat trace systems are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain heat trace systems.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 261200

SECTION 261300 - RACEWAYS AND BOXES

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 SUBMITTALS

A. Product Data: For floor boxes, hinged-cover enclosures, and cabinets.

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 NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Electrical Contractor shall furnish and install embedded electrical conduit, electrical box assemblies, and required hardware into the precast wall panels.

1. The Electrical Contractor shall provide locations on the precast shop drawing submittal and tradesmen in the precast production plant for this scope of work.
2. Precast Supplier shall provide coordination and production schedule with dates for each individual panel requiring electrical so the Electrical Contractor can schedule their workforce accordingly.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Shamrock Steel.
10. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. PVC Coated Rigid Steel Conduit: NEMA RN 1.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Steel, set-screw or compression type with insulated bushings for protection of conductors. Diecast fittings are not approved.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.

12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

D. LFNC: UL 1660.

2.3 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman.
2. Square D.
3. Mono Systems, Inc.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
b. Thomas & Betts Corporation.
c. Mono-Systems, Inc.
d. Walker Systems, Inc.; Wiremold Company (The).
e. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Outlet boxes shall be galvanized steel standard electrical type with knockout openings as required.

C. Outlet boxes shall be at least 1-1/2” deep, single or gang style type of sized to accommodate devices noted. Outlet boxes in masonry walls may be special masonry type. Outlet boxes on exposed conduit runs in unfinished areas and equipment rooms shall be 4” square or multi-gang boxes with matching raised covers. Outlet boxes on exposed conduit runs in finished areas or where indicated, shall be cast FS type.

1. Outlet boxes for communications outlets shall be a minimum of 2-1/8” deep.

D. Exterior outlet boxes shall be cast aluminum type with weatherproof cover and gasket. Outlet boxes for receptacle devices shall be provided with grounding lead lug or screw.

E. Outlet boxes installed in plaster, plasterboard, acoustic tile, or paneled surfaces shall be provided with plaster rings, except 4” octagonal ceiling boxes. Outlet boxes installed in masonry, tile, or concrete surfaces shall be provided with square corner type extension rings where special masonry boxes are not used.

F. Outlet boxes noted as WP (weatherproof) shall be a flush or surface (as noted) FS type box with at least 4 machine screw connections for a gasketed device or cover.

G. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

H. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

I. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

J. Systems furniture connections shall comply with NEC 605.

K. Floor Boxes (Two Devices): Floor boxes installed in tile or carpet floors shall be equal to Steel City 664 Series. Concealed service type, 2-compartment, steel (cast iron where in contact with earth) construction with solid aluminum #664-CST-SW-ALM hinged floor plate and retractable exit port for power cords and communications cables. Provide internal device mounting panels compatible with devices being installed. Provide wiring and communications devices as shown on the floor plans and specified.

1. Coordinate floor box types and covers in commercial kitchens with the food service equipment supplier as required for the receptacles to accommodate plug and cord associated with kitchen equipment.

L. Floor Boxes (Two Devices): Floor boxes installed in wood floors shall be equal to Wiremold Walker Wood Floor Series. 2-compartment steel type with flush activation assembly, two-gang aluminum flange and cover plates. Assembly shall be equal to Wiremold 880W2 floor box, 827B flange, and 828R cover plates. Where GFI receptacles are to be installed, provide 828GFI cover plates. Provide wiring and communications devices as shown on the floor plans and specified.

M. Floor Boxes (Up to Four Devices): Floor boxes installed in tile or carpet floors shall be equal to Steel City 665 Series. Concealed service type, 4-compartment, steel (cast iron where in contact with earth) construction with solid aluminum #665-CST-SW-ALM hinged floor plate and retractable exit port for power cords and communications cables. Provide internal device mounting panels compatible with devices being installed. Provide wiring and communications devices as shown on the floor plans and specified.

1. Coordinate floor box types and covers in commercial kitchens with the food service equipment supplier as required for the receptacles to accommodate plug and cord associated with kitchen equipment.

N. A/V Support Floor Boxes: Floor boxes installed in tile or carpet floors shall be equal to Steel City 665 AV2 Series. Concealed service type, 4-compartment, 2” knock-outs, steel (cast iron where in contact with earth) construction with solid aluminum #665-CST-SW-ALM hinged floor plate and retractable exit port for power cords and communications cables. Provide internal device mounting panels compatible with devices being installed. Provide wiring and communications devices as shown on the floor plans and specified.

O. Floor Boxes (Three Devices): Floor boxes installed in wood floors shall be equal to Wiremold Walker Wood Floor Series. 3-compartment steel type with flush activation assembly, three-gang aluminum flange and cover plates. Assembly shall be equal to Wiremold 880W3 floor box, 837B flange, and 838R cover plates. Where GFI receptacles are to be installed, provide 838GFI cover plates. Provide wiring and communications devices as shown on the floor plans and specified.

P. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

Q. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

R. Provide wall plates for all unused outlet and device boxes. Wall plates shall comply with section 261400.

S. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Provide backplate and grounding as required by the authority having jurisdiction for installation of indicated equipment.

T. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. ENT – Electrical Non-metallic Tubing is not acceptable for use anywhere on this project.

B. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC, see installation for additional requirements.
4. Underground, Grouped: RNC, see installation for additional requirements.
5. Underslab: RNC, see installation for additional requirements.
6. Embedded in slab: Rigid steel.
7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
8. Boxes and Enclosures: NEMA 250, Type 3R.

C. Indoors:

1. Exposed: EMT.
2. Concealed: EMT or MC Cable where allowed per NEC.
3. Underslab: RNC, see installation for additional requirements.
4. Embedded in slab: Rigid steel.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.

D. Minimum Raceway Size: ½-inch trade size (DN16), except home runs from the closest wiring device or light fixture at the home run designation to the associated panelboard shown on the electrical drawing sheets shall be ¾-inch (minimum) trade size (DN21).

E. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings with insulated bushings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.2 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated and in accordance to manufacturer's written instruction.
1. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
2. Install raceways level and square and at proper elevations. Provide adequate headroom.
3. Complete raceway installation before starting conductor installation.
4. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."
5. Install temporary closures to prevent foreign matter from entering raceways.
6. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab. Install a metal sleeve or concrete curb to provide a 4 inch high watertight barrier.
7. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
8. Metal-corrugated sheet roof decking: Install and support so that nearest outside surface of the raceway or box is not less than 1.5" from the nearest surface of the roof decking. In addition, cables, raceways, and enclosures shall not be installed in concealed locations of metal-corrugated sheet decking type roofing. Spacing from roof decking doesn't apply to rigid metal conduit or intermediate metal conduit.
9. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
    a. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
10. Exterior raceways:
    a. Install a minimum 24 inches below grade.
    b. Where multiple conduit runs are indicated, they shall be installed in the same trench.
    c. Where raceways stub into sub-grade levels, utilize installation methods to prevent migration of water into the building interior spaces.
    d. All 90 degree ells 1" trade size or larger must be rigid steel conduit.
    e. Transition to rigid steel conduit before the conduit is exposed.
    f. Metallic conduit exterior or within building limits, that is 1" trade size or larger and in contact with earth, shall be have factory applied vinyl plastic coating or be painted with heavy coat of bitumastic paint. Couplings shall be painted after assembly. Nicks in plastic coated conduit shall be painted with plastic material as recommended by the manufacturer. Where bitumastic paint is applied, the paint must be thoroughly dry prior to backfilling.
    g. Provide warning tape in accordance with specification section 260500.

11. Raceways underground or under slabs:
    a. All 90 degree ells 1" trade size or larger must be rigid steel conduit.
    b. Transition to rigid steel conduit before the conduit is exposed.
    c. Metallic conduit exterior or within building limits, that is 1" trade size or larger and in contact with earth, shall have factory applied vinyl plastic coating or be painted with heavy coat of bitumastic paint. Couplings shall be painted after assembly. Nicks in plastic coated conduit shall be painted with plastic material as recommended by the manufacturer. Where bitumastic paint is applied, the paint must be thoroughly dry prior to backfilling.
    d. Provide expansion fittings where conduits cross building expansion joints or where a wide temperature differential exists.
12. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 1 inch (25 mm) of concrete cover.
    a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
    b. Space raceways laterally to prevent voids in concrete.
    c. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
    d. Provide expansion fittings where conduits cross building expansion joints or where a wide temperature differential exists.
13. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
    a. Run parallel or banked raceways together on common supports.
    b. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
14. Outlet boxes shall be concealed except where shown or noted otherwise. Outlet boxes, plaster rings or extension rings shall be installed flush with the finished surface.
15. Where applicable, outlet boxes for controls and operating mechanisms shall be installed to comply with ADA mounting height requirements.
16. Junction and Pull Boxes
    a. Where necessary to terminate, tap-off, or redirect multiple conduit runs, provide and install appropriately sized junction boxes. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation. Provide pull boxes to limit conduit runs to less than 150 feet and to contain no more than the equivalent of three right angle bends.
    b. Use outlet boxes as junction boxes and pull boxes wherever possible and allowed by applicable codes. Make all boxes accessible and do not install boxes in finished areas. Mount all boxes plumb and level. Use flush mounted boxes with concealed conduits and make edges of boxes flush with the final surface.
    c. Install boxes supported independently of conduit by attachment to the building structure or a structural member.
17. Join raceways with fittings designed and approved for that purpose and make joints tight.
    a. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
    b. Use insulating bushings to protect conductors.
18. Tighten set screws of threadless fittings with suitable tools.

19. Terminations:
    a. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
    b. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
20. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
21. Telephone and Signal System Raceways for free air cabling technique. 2 Inch Trade Size (DN 53) and smaller. Provide minimum ¾ inch conduit from outlet box to 8 inches above accessible lay-in ceiling system, terminate with insulated bushing. Provide empty conduits, appropriately sized for the application, through floors and walls, above hard ceilings, and at exposed ceiling structure locations to provide clear and smooth pathways for cabling. Coordinate cable pathway requirements with data and voice cabling contractor.
22. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
    a. Service entrance conduits.
    b. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    c. Where conduits enter or exit the building.
    d. Where otherwise required by NFPA 70.
23. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
24. Flexible Connections: Use maximum of 72 inches (48 inches in ducts and plenums) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
25. Do not utilize aluminum conduit.
26. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
    a. Select each surface raceway outlet box, to which a lighting fixture is attached, to be of sufficient diameter to provide a seat for the fixture canopy.
    b. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and canopy (with or without extension ring), no separate outlet box is required.
    c. Provide surface metal raceway outlet box, backplate, and canopy at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
    d. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.
27. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
28. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
29. Direct Buried Conduit Backfill: Comply with Division 2 requirements.

B. Location of Outlets and Equipment.

1. Outlets shall be installed at the heights and approximate designated positions as shown on the Drawings and symbol legend, unless otherwise directed. Outlets in similar rooms shall be installed in the same relative location in each room. Outlets shall not be installed back to back but shall be offset approximately 6 inches.
2. Outlets shall be located to clear piping, ductwork, and other obstructions. Switch outlets shall be on the latch side of door except where type of construction dictates otherwise. Outlets in masonry or tile shall be located as far as practical adjacent to horizontal and vertical mortar joints to minimize cutting.
3. Verify locations and dimensions of electrical equipment, particularly in the case of door swings, heights of cabinets and counters, shelves, and location of equipment installed by the Owner or other trades.
4. Mounting heights indicated on the drawings shall be to center line of outlet unless indicated otherwise. Heights may be adjusted to align with mortar joints as specified above, however, all similar outlets in a given area shall be adjusted to the same height unless specifically noted at the outlet.
5. Receptacle outlets indicated to be installed "A.C." (above counter) shall be mounted not less than 3 inches higher than the top of the counter backsplash or at heights indicated.
6. All similar equipment such as panelboards, motor starters, disconnect switches, etc., shall be installed at the same heights throughout the building.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 261300

SECTION 261400 - WIRING DEVICES

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 receptacles, connectors, switches, and finish plates.

1.3 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates.

C. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

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.

B. Comply with NEMA WD 1 and NFPA 70.

1.5 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc.

b. Eagle Electric Manufacturing Co., Inc.
c. GE Company; GE Wiring Devices.
d. Hubbell, Inc.; Wiring Devices Div.
e. Killark Electric Manufacturing Co.
f. Leviton Manufacturing Co., Inc.
g. Pass & Seymour/Legrand; Wiring Devices Div.
h. Pyle-National, Inc.; an Amphenol Co.

2. Floor Service Outlets:

a. American Electric.
b. Hubbell, Inc.; Wiring Devices Div.
c. Mono Systems, Inc.
d. Pass & Seymour/Legrand; Wiring Devices Div.
e. Square D Co.
f. Wiremold.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Hard use (heavy duty) specification grade, minimum 20A rating, side wired.

B. GFCI Receptacles: Hard-use (heavy duty) specification grade, feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a standard outlet box without an adapter.

C. Dead Front GFCI Receptacles: Feed-through type, side wired, 20A rated, self test technology. Receptacles shall be equal to Hubbell CFBFST20.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: Heavy-duty grade, quiet type, 20A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-20R.

B. Snap Switches: Heavy-duty, quiet type, 20A, 120-277 volt – AC, with back and side wired screw terminals; Pass & Seymour PS20AC-1 or equal. Single-pole or three-way to suit connections.

C. Dimmer Switches: Modular, full-wave, solid-state units. Compatible with dimming drivers or lamps being controlled and be rated for 600W or 125% of the connected load, whichever is greater.

1. Control: On/Off switch with continuously adjustable slide switch.
2. LED dimmer switches shall be equal to Leviton IP710-LFZ with color change kit.
3. Filters: Include electromagnetic filter to reduce interference with radio, audio, and video equipment.
4. Where three-way dimming is shown on the drawings true three-way dimming shall be provided utilizing a system equal to Acuity Controls nPP16 Power/Relay Pack with nPODM On/Off + Raise/Lower control switches.

2.5 WALL PLATES

A. Single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Heavy-duty die-cast zinc.
    a. Where required by the authority having jurisdiction, receptacle covers shall be “While in Use”, “Extra-Duty” type, equal to Intermatic WP3110MXD, or WP1030MXD, or WP1010HMXD series, consisting of heavy-duty die-cast construction with lockable hasp.
    b. Switch covers shall be similar to Steel City SW series.

2.6 FLOOR SERVICE FITTINGS

A. Floor Boxes: See Specification Section 261300.

B. Power Receptacle: NEMA WD 6, Configuration 5-20R, white finish, unless otherwise indicated.

C. Signal Outlet: Standard receptacle plate compatible with service unit and phone/data adapter to fit plate.

2.7 WIRING DEVICE FINISHES

A. Color: White, unless otherwise indicated or required by Code.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Switches shall be installed so that the handle is down when the switch in the off position.

B. Receptacle and switch branch circuit wiring shall be terminated on the side wired screw terminals.

C. In storage, mechanical, and electrical equipment rooms where the receptacle is located adjacent to the light switch at 46" AFF, the devices shall be installed in a combination cover-plate and back-box assembly.

D. GFI Receptacles: Ground fault circuit-interruption for personnel shall be provided in accordance with the NEC articles 210.8 and 422.5.

1. The ground-fault circuit-interrupter shall be installed in a readily accessible location or provide dead-front GFI device at accessible location to protect receptacle.
2. If GFI receptacle is not available provide GFI circuit breaker in panelboard serving the receptacle.

E. Wet Locations: All 15- and 20-ampere 125- and 250-volt nonlocking receptacles shall be listed weather-resistant type.

F. Mechanical Equipment: Install service receptacles on vertical building surfaces or mount receptacles on the steel tubing and u-channel support/backboard assembly provided for mounting the enclosed controllers and switches. Do not mount service receptacles directly to mechanical equipment housings.

G. Install devices and assemblies level, plumb, and secure.

H. Where applicable, devices for controls and operating mechanisms shall be installed to comply with ADA mounting height requirements.

I. Provide tamper resistant receptacles in accordance with the NEC article 406.12.

J. Install wall plates when painting is complete.

K. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

L. Provide a dedicated neutral for each branch circuit serving light fixtures connected to wall dimmers. Do not share neutral conductor on load side of dimmers.

M. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multi-gang wall plates.

1. Exterior receptacles shall be installed with long dimension horizontal, mounting height of approximately 25" above finish grade.

N. Protect devices and assemblies during painting.

O. Adjust locations at which floor service outlets are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2. Receptacles: Identify panelboard and circuit number from which served. Use adhesive labels (machine generated black lettering on clear background) on faceplates (verify with the owner if this is desired) and durable wire markers or tags within outlet boxes.
3. Where receptacles are supplied through a GFCI breaker or connected “downstream” of a GFCI receptacle, the receptacle shall be marked “GFCI Protected”.
4. Dead front GFCI receptacles shall be labeled to identify the equipment being protected.
5. Where receptacles are controlled by an automatic control device the receptacles shall be marked in accordance with NEC article 406.3.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

C. Where multiple sets of conductors terminate at a box, provide pigtails to devices such that the continuity of the branch circuit conductors is not dependent upon device connections and the continuing load is not routed through the device. See section 261200 – Conductors and Cables.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper operation, polarity and ground continuity.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 261400

SECTION 261450 - LIGHTING CONTROL DEVICES

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 lighting control panels, time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 SUBMITTALS

A. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.

B. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

B. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions. Include coordination with the following:

1. Division 26 Section "Panelboards."
2. Division 26 Section “Interior Lighting.”
3. Division 26 Section “Exterior Lighting.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactors and Relays:
    a. Automatic Switch Co.
    b. Cutler-Hammer Products; Eaton Corporation.
    c. Furnas Electric Co.
    d. GE Lighting Controls.
    e. Hubbell Lighting, Inc.
    f. Siemens Energy and Automation, Inc.
    g. Square D Co.; Power Management Organization.
2. Time Switches:
    a. General Electric
    b. Intermatic, Inc.
    c. Leviton Manufacturing.
    d. Paragon Electric Co., Inc.
    e. Tork, Inc.
3. Photoelectric Relays:
    a. Allen-Bradley/Rockwell Automation.
    b. Area Lighting Research, Inc.
    c. GE Lighting Controls
    d. Intermatic, Inc.
    e. Paragon Electric Co., Inc.
    f. Tork, Inc.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations

2.3 TIME SWITCHES

A. Description: Electromechanical-dial type complying with UL 917.

1. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
2. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
3. Seven-day program uniquely programmable for each weekday and holidays.
4. Skip-day mode.

2.4 PHOTOELECTRIC RELAYS

A. Description: Contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.

B. Light-Level Monitoring Range: 0 to 500 fc, with an adjustment for turn-on/turn-off levels.

C. Fail mode shall be on.

D. Time Delay: Prevents false operation.

E. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.5 MULTIPOLE CONTACTORS AND RELAYS

A. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.

1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
2. Control Coil Voltage: Match control power source.
3. Two Wire Operation: Provide additional control relays as required for two wire operation associated with photocell and switching applications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment level and plumb and according to manufacturer written instructions.

B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Section "Basic Electrical Materials and Methods."

C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26 Section "Conductors and Cables" for low-voltage connections and Division 26 Section "Voice and Data Systems" for digital circuits.

B. Wiring Method: Install all wiring in raceway as specified in Division 26 Section "Raceways and Boxes."

C. Bundle, train, and support wiring in enclosures.

D. Ground equipment.

E. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Lighting Control Enclosure Nameplates: Label each lighting control panel and contactor with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 FIELD QUALITY CONTROL

A. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

B. The lighting control system shall be programmed to execute and perform all functions required to effectively operate the site according to the owner and engineer requirements. Coordinate control system operation with engineer during shop drawing review.

C. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

D. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.

E. Verify settings of photoelectric devices with photometer calibrated within previous six months.

F. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

1. Continuity tests of circuits.
2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

    a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

G. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

H. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

I. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.6 DEMONSTRATION

A. Coordinate with training for low-voltage, programmable lighting control system specified in Division 26 Section "Lighting Controls."

B. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of four hours' training.
2. Training Aid: Use the approved final version of maintenance manuals as a training aid.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 261450

SECTION 262890 – SURGE PROTECTION DEVICES (SPD's)

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 surge protection devices for low-voltage power, control, and communication equipment.

B. Provide at locations indicated on power riser diagram. Connect to 60A/3P circuit breakers as indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of surge protection devices, certifying that products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification.
2. UL 1449 listing and classification (third edition).

C. Maintenance Data: For surge protection devices to include in maintenance manuals specified in Division 1.

D. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain surge protection devices and accessories through one source from a single manufacturer.

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. Surge protection devices shall be designed in accordance with ANSI/IEEE C62.41.1-2002, C62.41.2-2002, and C62.45-2002.

D. UL Compliance: Comply with Underwriters Laboratories ANSI/UL 1283, 5th Edition - "Electromagnetic Interference Filters" (applies to type 2 SPD's).

E. UL Compliance: Comply with Underwriters Laboratories ANSI/UL 1449 3rd Edition – "Surge Protective Devices".

1.5 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment, switchboards, panelboards, control terminals, data terminals, etc. to their sources until the surge protective devices are installed and connected.

B. 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.

C. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
3. Humidity: 0 to 85 percent, noncondensing.

1.6 COORDINATION

A. Coordinate location of field-mounted surge protectors to allow adequate clearances for maintenance.

1.7 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. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship for a period of not less than ten years from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Manufacturers of a Broad Line of Surge Protection Devices:
   a. Advanced Protection Technologies.
   b. Eaton Corp.; Cutler-Hammer Products.
   c. General Electric.
   d. Intermatic.
   e. Liebert/Emerson.
   f. Square D by Schneider Electric.

2. Manufacturers of Category A and Telephone/Data Line Suppressors:

   a. EDCO (Emerson Network Power Surge Protection).
   b. MCG Electronics, Inc.
   c. NTE Electronics, Inc.
   d. Telebyte Technology, Inc.

2.2 SERVICE ENTRANCE SURGE PROTECTION DEVICES

A. Type 2 SPD's, comply with ANSI/UL 1283.

B. Surge Protective Device Description: Modular type with the following features and accessories:

1. The system shall be designed for easy servicing by a qualified field electrician, providing simple change out of any or all TVSS modules. Designs that require factory service are not acceptable. Any unit using "plug-in" type modules are not acceptable. All connections, conductors, and terminals must be appropriately sized for specified surge current capacity.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.
4. One set of dry contacts rated at a minimum of 2A and 24Vdc, for remote monitoring of protection status.
5. Redundant suppression circuits.
6. Minimum withstand rating of 20kA per mode.
7. Redundant replaceable modules (if Surge Current Rating is above 200kA per phase).
8. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
9. Surge-event operations counter.

C. Surge Current Rating: 120kA per mode, 240kA per phase.

D. Connection Means: Permanently wired.

E. Protection modes and UL 1449 voltage protection for grounded wye circuits with voltages of 208Y/120 V, three-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 800 V.
2. Line to Ground: 800 V.
3. Neutral to Ground: 800 V.
4. Line to Line: 1200V.

F. SCCR: Per NEC 285.6, the short circuit current rating of the SPD shall be equal to or greater than the AIC rating of the associated switchboard or panelboard to which the SPD is being connected

G. Nominal Discharge Current Rating:

1. Surge protective devices must carry a minimum Nominal Discharge Current Rating of 20kA to meet the requirements of UL96A – Installation Requirements for Lightning Protection Systems.

2.3 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

1. Provide multi-pole circuit breaker as a dedicated disconnect for the SPD, unless otherwise indicated.

B. Install devices for panelboard and auxiliary panels with conductors between SPD and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multi-pole circuit breaker as a dedicated disconnect for the SPD, unless otherwise indicated.

3.2 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.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.
3. Perform each visual and mechanical inspection test stated in NETA ATS, Section 7.19.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
2. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
3. Schedule training with Owner, through Architect, with at least seven days' advance notice. Provide a minimum of 1 hour of training at each of two sessions.

END OF SECTION 262890

SECTION 264100 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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 individually mounted enclosed switches and circuit breakers used for the following:

1. Motor and equipment disconnecting means.

1.3 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switch and circuit breaker.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Mark each product data sheet with the tag number and equipment description indicated on the mechanical equipment schedule and/or power riser diagram.
b. Enclosure types and details for types other than NEMA 250, Type 1.
c. Current and voltage ratings.
d. Short-circuit current rating.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
3. Time-current curves, including selectable ranges for each type of circuit breaker.

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 NEMA AB 1 and NEMA KS 1.

C. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 110 deg F (43 deg C).
2. Altitude: Not exceeding 1500 feet (450 m).

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate features, accessories, and functions of each enclosed switch with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fusible and Non-fusible Switches:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Schneider Electric (Square D Co.)
d. Siemens Energy & Automation, Inc.

2. Molded-Case Circuit Breakers:

    a. Eaton Corp.; Cutler-Hammer Products.
    b. General Electric Co.; Electrical Distribution & Control Division.
    c. Schneider Electric (Square D Co.)
    d. Siemens Energy & Automation, Inc.

3. Combination Circuit Breaker and Ground-Fault Trip:

    a. Eaton Corp.; Cutler-Hammer Products.
    b. General Electric Co.; Electrical Distribution & Control Division.
    c. Schneider Electric (Square D Co.)
    d. Siemens Energy & Automation, Inc.

2.2 ENCLOSED SWITCHES

A. Enclosed, Non-fusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 1600 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 200 A and larger.
2. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable setting for circuit-breaker frame sizes 250 A and larger:

    a. 100% rated.
    b. Instantaneous trip.
    c. Long- and short-time pickup levels.
    d. Long- and short-time time adjustments.
    e. Ground-fault pickup level, time delay, and I^2t response.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.5 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install enclosed switches and circuit breakers in locations as indicated, according to manufacturer’s written instructions. Verify that the installation will be accessible and will provide the clearances as required by the NEC article 110-26.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Mechanical Equipment: Install enclosed switches on vertical building surfaces or provide steel tubing and u-channel support/backboard assembly for mounting enclosed switches. Do not mount enclosed switches directly to mechanical equipment housings.

D. Exterior Enclosures: Mount enclosures at elevations to maximize aesthetics and minimize viewing angles by the public.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Enclosure Nameplates: Label each enclosed switch and circuit breaker with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Label shall indicate the equipment being served.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. 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 264100

SECTION 264150 - TRANSFER SWITCHES

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 transfer switches rated 600V and less, including the following:

1. 800A, 208V, 3-Phase, Open-Transition SUSE Automatic transfer switch, 65K SCCR minimum.

1.3 SUBMITTALS

A. Product Data: Include ratings and dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

B. Wiring Diagrams: Detail wiring for transfer switches and differentiate between manufacturer-installed and field-installed wiring. Show both power and control wiring.

C. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements and that switches have been tested for load ratings and short-circuit closing and withstand ratings applicable to units for Project.

D. Maintenance Data: For each type of product to include in maintenance manuals specified in Division 1. Include all features and operating sequences, both automatic and manual. List all factory settings of relays and provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing emergency maintenance and repairs at Project site with an eight-hour maximum response time.

B. Source Limitations: Obtain automatic transfer switch through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction.

D. Comply with NFPA 70.

E. Comply with NFPA 99.

F. Comply with NFPA 110.

G. Comply with UL 1008, unless requirements of these Specifications are stricter.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver transfer switch to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards.

1.6 WARRANTY

A. General Warranty: Special warranty 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. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace packaged engine generator and auxiliary components 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 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Conventional Transfer Switches:

a. Caterpillar, Inc.; Engine Division.
b. Emerson Electric Co.; Automatic Switch Co. Subsidiary.
c. GE Zenith Controls
d. Generac Corp.
e. Kohler Co.
f. Onan Corp.; Electrical Products Division.
g. Spectrum Detroit Diesel.
h. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch AIC ratings cannot be met, provide a fused disconnect switch ahead of the transfer switch with current-limiting fuses to provide required AIC ratings.

C. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels have communications capability matched with remote device.

D. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

E. Resistance to Damage by Voltage Transients: Components meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

G. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6; UL 508, unless otherwise indicated.

H. Factory Wiring: Train and bundle factory wiring and label consistent with Shop Drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.

1. Designated Terminals: Pressure type suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

J. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units rated 225A and greater have separate arcing contacts.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

C. Signal-before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 5 minutes.

D. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

E. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

2.4 AUTOMATIC TRANSFER-SWITCH FEATURES

A. Under-voltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator set. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes; factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained under-voltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source-Available Indicating Lights: Supervise sources via transfer-switch, normal- and emergency-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

H. Unassigned Auxiliary Contacts: Two normally open single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

I. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

J. Engine Starting Contacts: One isolated, normally closed and one isolated, normally open, rated 10 A at 32-V dc minimum.

K. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes; factory set for five minutes. Initiates shutdown at remote engine-generator controls after retransfer of load to normal source.

L. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine-generator set and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 30-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
2. Push-button programming control with digital display of settings.
3. Integral battery operation of time switch when normal control power is not available

2.5 FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.6 SOURCE QUALITY CONTROL

A. Factory Test Components, Assembled Switches, and Associated Equipment: Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Annunciator and Control Panel Mounting: Integral to ATS.

3.2 WIRING TO REMOTE COMPONENTS

A. Provide two interface points with the Building Automation System to indicate when the switch is in the emergency power position and to indicate prior (5 minutes) to when the switch is to transfer back to normal power source.

B. Provide interface with the generator load bank circuit breaker to shunt trip the circuit breaker prior to transferring load to the generator.

C. Match type and number of cables and conductors to control and communications requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Transfer Switch Nameplates: Label each transfer switch with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

1. Each transfer switch label shall indicate the transfer switch name, voltage and phase, ampere rating, short circuit current rating, and where the transfer switch is fed from.

3.4 CONNECTIONS

A. Ground equipment as indicated and as required by NFPA 70.

3.5 FIELD QUALITY CONTROL

A. Testing: Test transfer-switch products by operating them in all modes. Perform tests recommended by manufacturer under the supervision of manufacturer's factory-authorized service representative. Correct deficiencies and report results in writing. Record adjustable relay settings.

B. Testing: Perform the following field quality-control testing under the supervision of the manufacturer's factory-authorized service representative in addition to tests recommended by the manufacturer:

1. Before energizing equipment, after transfer-switch products have been installed:

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage; proper installation and connection; and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown sequence.

C. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

1. Assist in verifying grounding connections and locations and ratings of sensors.
2. Assist in observing reaction of circuit-interrupting devices when simulated fault current is applied at sensors.

D. Coordinate tests with tests of generator plant and run them concurrently.

E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean equipment internally, on completion of installation, according to manufacturer's written instructions.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain transfer switches and related equipment as specified below:

1. Coordinate this training with that for generator equipment.
2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
4. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
5. Schedule training with Owner, through Architect, with at least seven days' advance notice.
6. Provide a minimum of four hours of instruction.

END OF SECTION 264150

SECTION 264200 - ENCLOSED CONTROLLERS

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 ac general-purpose controllers rated 600 V and less that are supplied as enclosed units.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Mark each product data sheet with the tag number and description indicated on the mechanical equipment schedule.

B. Maintenance Data: For enclosed controllers and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for enclosed controllers and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

C. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain, within 100 miles (160 km) of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.

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.

D. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subjected to weather, cover enclosed controllers to protect from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.6 PROJECT CONDITIONS

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 at least two days in advance of proposed utility interruptions. Identify extent and duration of utility interruptions.
2. Indicate method of providing temporary utilities.
3. Do not proceed with utility interruptions without Architect's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

D. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

E. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Manual and Magnetic Enclosed Controllers:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electrical Distribution & Control.
c. Rockwell Automation Allen-Bradley Co.; Industrial Control Group.
d. Schneider Electric (Square D Co.)
e. Siemens/Furnas Controls.

2.2 MAGNETIC ENCLOSED CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across-the-line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer with secondary fuse protection. The control power transformer shall have sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a nationally recognized testing laboratory.
2. Non-fusible Disconnecting Means: NEMA KS 1, heavy-duty, non-fusible switch.
3. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

D. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 10 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.

E. Adjustable Overload Relay (shall be provided for all starters associated with 3 phase motors rated at 5HP or larger): Solid state, 3 to 1 adjustment for trip current, and protect motor against voltage and current unbalance and phase loss.

2.3 ENCLOSURES

A. Description: Flush- or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 MANUAL MOTOR CONTROLLERS

A. Fractional Horsepower Manual Starters: NEMA ICS 2; AC general purpose Class A manually operated, 1 or 2 pole, full-voltage controller rated for 1 horsepower, with adjustable one-piece melting alloy type thermal overload unit rated for connected load, and toggle operator, suitable for flush mounting in finished spaces. NEMA 3R lockable controller for exterior locations.

2.5 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosed controllers before shipping.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional horsepower manual controllers for single-phase motors, unless otherwise indicated.

D. Use manual controllers for 3-phase motors up to 5 horsepower not requiring automatic or remote control.

E. Push-Button Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with sealing auxiliary contact for low-voltage protection.

F. Hand-Off-Automatic Selector Switches: Provide in covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install enclosed controllers in locations as indicated, according to manufacturer's written instructions. Verify that the installation will be accessible and will provide the clearances as required by the NEC article 110-26.

B. See Division 26 Section "Basic Electrical Materials and Methods" for general installation requirements.

C. Install independently mounted control devices according to manufacturer's written instructions.

D. Locate controllers within sight of motors controlled, unless otherwise indicated.

E. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Basic Electrical Materials and Methods."

F. Mechanical Equipment: Install enclosed controllers on vertical building surfaces or provide steel tubing and u-channel support/backboard assembly for mounting enclosed controllers. Do not mount enclosed controllers directly to mechanical equipment housings.

G. Exterior Enclosures: Mount enclosures at elevations to maximize aesthetics and minimize viewing angles by the public.

H. Install freestanding equipment on concrete bases complying with Division 3 Section "Cast-in-Place Concrete."

I. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Enclosure Nameplates: Label each enclosed controller with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Label shall indicate the equipment being served.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers according to Division 26 Section "Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.

1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.

2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

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.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements. Perform the following field quality-control testing:

1. Perform each visual and mechanical inspection indicated in NETA ATS, Sections 7.5, 7.6, and 7.16.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.7 CLEANING

A. Clean enclosed controllers internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

B. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.8 STARTUP SERVICE

A. Verify that enclosed controllers are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections and complete installation and startup checks.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 264200

SECTION 264420 - PANELBOARDS

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 load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

1. Lighting and appliance branch-circuit panelboards.
2. Distribution panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, 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. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:

1. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
   a. Copies of panelboard schedules shall be provided in the operation and maintenance manuals in case circuit directories in the panelboards are lost.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current curves, including selectable ranges for each type of overcurrent protective device.

D. Panelboard Overcurrent Protection Device Arrangement: To the extent possible, coordinate with panelboard supplier for correct arrangement of overcurrent protection devices (OCPD's) within panelboards to match panelboard schedules shown on the electrical drawings. The contractor shall rearrange OCPD's if necessary to match the schedules shown on the electrical drawings.

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 NEMA PB 1.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.6 EXTRA MATERIALS

A. Keys: Four spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

    a. American Midwest Power.
    b. Eaton Corp.; Cutler-Hammer Products.
    c. General Electric Co.; Electrical Distribution & Control Div.
    d. Schneider Electric (Square D Co.)
    e. Siemens Energy & Automation, Inc.

2.2 FABRICATION AND FEATURES

A. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

B. Covers:
   1. Provide hinged front trim cover with front trim hinged to box with standard circuit breaker access door within hinged trim cover. Provide flush latch with tumbler lock for circuit breaker access door.

C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

E. Phase, Neutral, and Ground Bus Material: Material shall be determined by the conductor material being used for this project. If copper conductors are being used, bus material shall be 98 percent conductivity copper. If aluminum conductors are being used, bus material shall be tin-plated, high-strength, electrical-grade aluminum alloy.
   1. If bus is aluminum, use copper or tin-plated aluminum for circuit-breaker line connections.
   2. If bus is copper, use copper for feeder circuit-breaker line connections.

F. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.

G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

H. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

I. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main and Branch Overcurrent Protective Devices: Circuit breakers.

C. See Specification Section 262890 – Surge Protection Devices.

2.6 PANELBOARD SURGE PROTECTION DEVICES

A. See Specification Section 262890 – Surge Protection Devices.

2.7 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mounting: Surface mount panelboards shall be mounted to ¾" plywood backboards. Paint backboards with two coats of grey fire-retardant paint.

D. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Circuit Directory (For new and existing panelboards): Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

1. Room names or Owner's room numbers shall be used. Do not use plan room numbers unless approved by the owner.
2. Spare circuit breakers shall be identified as such.

F. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

1. Lighting and Appliance Panelboards: Each lighting and appliance panelboard label shall indicate the panelboard name, voltage and phase, and where the panel is fed from.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers.
2. Where ground-fault protection of equipment is required for services, provide performance testing and documentation in accordance with NEC article 230.95(C).
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 264420

SECTION 264910 - FUSES

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 cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, controllers, and motor-control centers; and spare fuse cabinets.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information. If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses adjusted.

1. For each adjusted fuse, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Maintenance Data: For tripping devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide fuses from a single manufacturer.

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 NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (4.4 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

B. Coordinate fuse ratings for Type 2 protection of motor starters, contacts, and overload relays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.; Bussmann Div.
2. General Electric Co.; Wiring Devices Div.
3. Gould Shawmut.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK5 or Class J, dual-element, time-delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 264910

SECTION 265119 - LED LIGHTING

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 interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, LED's, drivers, emergency lighting units, and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. Types of lamps.

B. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

A. General Warranty: Special warranty 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. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 5 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for last four years.

C. Special Warranties for LED drivers: Written warranty, executed by manufacturer agreeing to replace drivers that fail in materials or workmanship within specified warranty period.

1. Special Warranty Period for LED drivers: Five years from date of manufacture, but not less than four years from date of Substantial Completion.

2. Special Warranty Period for Electronic Emergency Ballasts: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Lighting Fixture Schedule.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging. All parts shall be painted after fabrication to facilitate installation, increase efficiency, and inhibit rusting.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 90 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

F. Electromagnetic Interference Filters: Integral to fixture assembly. Provide one filter for each ballast. Suppress conducted electromagnetic interference filters as required by MIL-STD-461.

2.3 LIGHTING FIXTURES

A. See the “Lighting Fixture Schedule” on plans.

1. Upper case letter at fixture outlet symbol or in note on Drawings indicated the fixture type. Lower case letter at fixture symbol indicated switching circuit. Any outlets not specifically labeled shall be equipment with fixture similar to those in rooms used for like purposes.
2. Fixtures requiring plaster frames or other special frames shall be furnished with these frames as required for type of construction. Fixtures requiring additional accessible outlet connection boxes and additional wiring from outlet box to fixture, shall be furnished with this wiring per the N.E.C. and Local Code requirements. Frames of all recessed fixtures shall be tight to the ceiling to eliminate light leaks. Gasketing shall be used to eliminate all light leaks.

2.4 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:

1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.5 LAMPS

A. Lamps as manufactured by Osram Sylvania, Phillips Lighting, or General Electric.

B. Lighting fixtures shall qualify for utility rebates (www.cee1.org). Coordinate utility rebate process with utility company and owner for applicable items.

C. LED:

1. Interior Selections - Color Temperature: See lighting fixture schedule.

2.6 PONENTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.7 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects, after fabrication.
2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
1. Where specific lamp designations are not indicated or specified, lamp fixtures according to manufacturer’s recommendations.
2. Square light fixtures shall be orientated so all light sources run in the same direction in the same room, corridor, or definable space.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. For fixtures with a weight greater than 7 lbs per square foot of occupied ceiling space, install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners. These rods or wires shall be secured to individual support points directly vertical from attachment point to fixture to the extent possible.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Fire Rated Ceilings:

1. Lighting fixtures that are not fire rated for the ceiling they are to be installed in shall be provided with a fire rated enclosure. Enclosure shall be suitable for the application as approved by the local Authority Having Jurisdiction (AHJ). Contractor shall review architectural plans to determine which ceilings, if any, are to be constructed as fire rated assemblies and shall include the protection of any and all light fixtures installed in these ceilings in his/her bid.

D. Exit Light Installation in Grid-Type Suspended or Gyp Board Ceilings:

1. Support electrical boxes firmly to the deck structure utilizing uni-strut or other acceptable means. Fixtures shall not be easily turned or rotated from below.

E. Emergency ballast test switch installation:

1. Where the test switch is not integral to the fixture housing or reflector, install switch at a location coordinated with the Architect/Engineer, up to 50’ away from the emergency ballast location.

F. Emergency Lighting Fixtures: Provide unswitched normal building power to all fixtures provided with generator transfer ballasts (GTD) for local power failure indication. The unswitched power connection shall be from an emergency branch.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

C. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

D. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 265119

SECTION 277260 - PUBLIC ADDRESS AND MUSIC EQUIPMENT

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 all labor, materials, equipment, and related services for amplifying, distributing, and reproducing sound signals.

B. The Paging Sound System shall consist of amplifiers, speakers, priority paging volume controls, and other devices, as required to form a complete system. Amplifier and associated equipment shall be housed in a common enclosure located in the communications rooms.

C. Paging access shall be on a normal and emergency all call basis, utilizing the customer provided telephone system for page initiation.

D. Paging Zones (As directed by Owner): 8-zones minimum + all-call.

E. Paging system shall also be capable of being used as a sound masking system.

1.3 PERFORMANCE REQUIREMENTS

A. System Functions: Include the following:

1. Paging, by dialing either a normal page extension or emergency page extension from any local telephone instrument and speaking into the telephone.
2. Reproducing high-quality sound that is free from noise and distortion at all loudspeakers at all times during equipment operation, including standby mode with inputs off; and output free from non-uniform coverage of amplified sound.
3. Ability to distribute background music.

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Division 1 and as further described herein.

B. Submittals shall include major equipment material lists, summarizing every item to be provided, by manufacturer, part number, quantity, and include a brief summary of each item. Manufacturer’s product data sheets, describing each of the major components shall also be provided.

C. Submittals shall be tab divided by system to aid in identifying the products associated with each system.

D. Shop Drawings: Detailed floor plans showing device locations, conduit routing, wire quantity and sizes, and connection diagrams. Provide a functional block diagram and complete termination diagrams showing all headend and control termination and typical field device terminations. Provide proposed equipment rack layout.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components.

E. Maintenance manuals shall be compiled in accordance with the Division 1, shall include all information provided as part of the original submittal and shall also be updated to include installation notes, manufacturer's manuals, etc. Manuals shall also include:
1. Descriptions of all equipment and detailed operating instructions.
2. Final shop drawings, updated to reflect "as-built" accuracy. Include outlets with label ID's, and cable designations and routing information.
3. Field test reports shall be provided, indicating and interpreting test results for compliance with performance requirements of the Project.
4. Maintenance data shall be included for all major pieces of equipment, as per the requirements specified in Division 1.
5. Copy of major equipment manufacturer's standard warranty statements, for future reference and use, should claims need to be submitted.

1.5 QUALITY ASSURANCE

A. The System shall be installed by a contractor experienced in the installation of Public Address Sound Systems. The services of a technical support organization, trained by the equipment manufacturer, shall be retained by the Electrical Contractor to supervise the installation, make final system connections, and perform all tests and balance work required.

1.6 COORDINATION

A. Coordinate work of this section with the owner's digital telephone switching system supplier for interface requirements. It is the intent of this specification to ensure that this public address sound system be interfaced to and work in an integrated manner with the digital telephone switching system.

1. To that end, this contractor shall include all costs of labor and materials necessary to ensure that the public address system interface is complete and functioning with the digital telephone switching system.
2. This contractor shall work with the digital telephone switching system provider, at no additional cost to the owner, to complete all tie-ins between the public address system and the telephone switch and to ensure that the entire integrated system operates properly and is properly documented for the owner's use.

1.7 OCCUPANCY ADJUSTMENTS

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions. Provide up to one on-site assistance visit within one year of Substantial Completion.

PART 2 - PRODUCTS

2.1 APPROVALS

A. The Products that are to be provided to form the system described herein are defined both functionally and descriptively. It is to be understood that these explanations are provided to establish minimum acceptable standards of performance and appearance. Product make and model numbers have also been provided to further define and more closely describe specific operational characteristics and/ or to make the contractor aware of the owner's preference for particular products.

B. If, in the estimation of a qualified potential supplier or installer, equipment of other manufacture could be substituted without compromising the integrity of the installation or its' overall design intent, then a request for consideration to substitute said product must be made in writing at least seven (7) days prior to bid date, fully describing the substitution.

C. Any exceptions to specifications, in terms of product appearance, configuration, operation or capabilities, which alter a potential bidder's ability to meet these specifications shall be fully disclosed to the Architect/ Engineer at the time a request for approval to bid is received.

1. Operational features and characteristics which exceed the requirements set forth in this specification as a minimum standard need not be disclosed at the time of product consideration for approval.

D. Notice of all bidder and product approvals shall be by addendum issued prior to bid date.

2.2 EQUIPMENT

A. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Modular type, using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Waterproof Equipment: Listed and labeled for duty outdoors or in damp locations.

2.3 EQUIPMENT ENCLOSURE

A. The sound system equipment enclosure shall be equal to Soundolier Model 320-17 surface wall enclosure with hinged door and mid section. Enclosure to be painted black. Ensure that adequate side clearance (minimum of 15") is maintained to allow opening of enclosure for servicing. Provide blank and vented panels as required for all unused rack spaces.

2.4 COMPONENTS

A. A package type Mixer Amplifier shall be provided to accept both paging and music inputs. This amplifier shall serve all building speakers. Amplifier shall be rated at 120 watts continuous and include individual input controls (minimum of 5), master volume and tone controls. Inputs shall accommodate microphone, telephone, and auxiliary music sources, as required for the application. Amplifier response shall be ±3% from 50Hz to 15,000Hz with distortion at less than 1% at RPO. Amplifier shall be a Bogen Model PS-120 with PSRPK Rack Mount Kit.

B. Provide rack mount shelf to mount Owner provide music source. Shelf shall be Middle Atlantic RSH Series, 3 rack units high and 14" deep.

C. Provide a rack mount power distribution unit, rated at 15 amps, equipped with 8 rear outlets and one front outlet. Unit shall include surge and spike protection, EMI filtering, and a 9' cord. An illuminated combination power switch/circuit breaker shall be located on the front panel of the unit. Power distribution unit shall be Middle Atlantic PD-915R.

D. Telephone Paging Adapter (VOIP): Arranged to accept voice signals from telephone extension dialing access. Shall provide for direct connection to page ports, loop start and ground start trunks. Telephone paging adapter shall be coordinated with the owner for matching existing conditions.

1. Normal and Emergency Page.
2. Minimum Frequency Response: Flat, 200 to 2500 Hz.
3. Impedance Matching: Adapter matches telephone line to public address equipment input.

E. Provide a regulated DC power supply for power of control equipment and priority paging volume controls. Unit shall be compact, multi-voltage type with outputs of 24, 12, and 6VDC, 2 amps. Power supply shall be equal to Soundolier PS24-20.

F. Miscellaneous Controls and Power Supplies: Provide all special controls, auxiliary power supplies, relays, matching transformers, etc., required and necessary to accomplish the system operation described in these specifications.

G. Recessed Ceiling Speaker shall be equal to Bogen drop-in ceiling speakers #CSD2x2U.

H. In-Wall Speaker shall be equal to Speco Technologies recessed/flush mounted speaker #SP6MAWT.

I. Priority Paging Volume Controls shall be Atlas AT-10-PA and AT-35-PA type, sized for the intended use. Volume controls are the auto transformer type with integral 24VDC relay for bypass of the attenuator.

J. Wire and Cable shall be as recommended by the equipment manufacturer. In general, conductors shall be stranded and not less than #18 ga. for all speaker runs. Cables shall bear either a CL2 or CL2P label, as required for the application.

1. Cables shall bear the CL2P label and be listed for Plenum use where required.
2. Speaker/Priority Paging Cable shall be equal to West Penn 25440, #18 ga., two pair, twisted, shielded pair type.
3. Speaker Cable shall be equal to West Penn 25293, #18 ga., twisted, shielded pair type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation shall be in accordance with the latest requirements of the NEC, State, and Local Codes, ordinances and regulations of any other governing body having jurisdiction

B. All equipment shall be installed in a neat and workmanlike manner and to the satisfaction of the Project Engineer.

C. Install equipment to comply with manufacturer's written instructions.

D. Wiring Method: Install wiring in raceway except within consoles, cabinets, desks, counters, accessible ceiling spaces, and in gypsum board partitions where “free air” cable wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and wiring except in unfinished spaces. All cabling routed at exposed ceiling structure in finished spaces shall be installed in raceway. All wiring installed underground or underslab shall be wet location listed.

1. Whether system cabling is installed in cable tray or “free air”, the system cabling shall be neatly run and shall be bundled separately from all other systems cabling.

2. Where cable is run “free air”, the cable shall be rated for the intended use and shall be neatly run and supported, using acceptable means to ensure reliable installation and performance.
   a. Install cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
   b. Install sleeves for cable penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls. Provide insulated bushings for protection of conductors.
   c. Secure and support cable at intervals not exceeding 8 feet and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   d. Utilize cable distribution rings and hangers, standoffs, spools and other suitable devices as an aid in managing all cable runs. Where cable tray is not provided and where 10 or more cables are routed together, cable distribution rings or hangers shall be wall or ceiling mounted above accessible ceilings at varying 4 to 6 foot intervals.

e. Cables shall not be laid on or draped across any ceiling tiles, grids, electrical or mechanical fixtures. Maintain at least a 12 inch separation between the communications cables and fluorescent or HID lighting.
f. Cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

F. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

G. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

H. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

I. All shields for speaker and microphone/auxiliary cables shall be maintained whole, unbroken, and isolated from ground at all locations except the control headend.

J. Match input and output impedance and signal levels at signal interfaces. Provide matching networks where required.

K. Identification:
1. Color-code conductors and apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.
2. Mark all control settings with small adhesive “dots”.

L. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

M. Weatherproof Equipment: Install units that are mounted outdoors, in damp locations, or where exposed to weather consistent with requirements of weatherproof rating.

N. Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

3.2 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installations, including connections. Report results in writing.

B. All devices, including speakers, shall have final connections made be persons familiar with the trade. Work to be accomplished in craftsman-like manner. Installer shall test, calibrate, and adjust all speaker tap settings and controls to obtain the best, most uniform coverage possible for the application.

C. Operational Test: Perform tests that include originating program and page material at telephone instruments, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and freedom from noise and distortion.

1. Measure and record the impedance of each loudspeaker line before connecting it to the output of its respective amplifier.
2. Measure and record the output impedance of each active device operating as a source to any passive device or series of passive devices.
3. Measure and record the input impedance of any active device used to terminate passive devices.

D. Power Output Test: Measure electrical power output of each power amplifier at normal gain setting at 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

E. Signal Ground Test: Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Division 26 Section "Grounding."

F. Retesting: Correct deficiencies, revising tap settings of speaker-line matching transformers where necessary to optimize volume and uniformity of sound levels, and retest. Prepare written record tests.

G. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

H. Schedule tests with at least seven days' advance notice of test performance.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment as specified below:

1. Train Owners maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment. Provide a maximum of two training sessions, to last no more than one (2) hour each, prior to occupancy.
2. Review data in maintenance manuals.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 277260

SECTION 277400 - COMMUNICATION AND DATA-PROCESSING EQUIPMENT

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 wire, cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for voice and high-speed data transmission.

B. The data transmission system shall be a Manufacturer Certified Category 6 system as specified and indicated on the drawings. Warranty shall be a minimum of fifteen years.

1. The system shall incorporate commercial grade products as specified. Lead frame and residential grade products are not acceptable.

C. This contractor shall be responsible for the removal and legal disposal of all abandoned communications cabling and devices.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Division 1 and as further described herein.

B. Submittals shall include major equipment material lists, summarizing every item to be provided, by manufacturer, part number, quantity, and include a brief summary of each item. Manufacturer’s product data sheets, describing each of the major components shall also be provided.

C. Submittals shall be tab divided by system to aid in identifying the products associated with each system.

D. Shop Drawings: Include dimensioned plan and elevation views of components. Show access and workspace requirements.

1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Owner.

E. Product Certificates: Signed by manufacturers of cables, connectors, and equipment certifying that products furnished comply with requirements.

F. Qualification Data: Submit evidence that the firms and persons scheduled by this contractor to execute the installation, termination and testing of the communication and data processing equipment are qualified to properly complete all work required and that they are properly registered or certified as specified in the "Quality Assurance" Article.

G. Maintenance Data: For products to include in maintenance manuals specified in Division 1.

1. Descriptions of all equipment and normal operating procedures.
2. Provide as-built floor plan drawings showing all installed outlets with label ID's and cabling designation and routing information.
3. Provide riser diagrams showing all cabling as installed.
4. Provide warranty information required by manufacturers for submission of warranty claims for all materials installed.
5. Include a complete proof of performance report outlining the operating parameters tested, complete test results and a review of industry standards for each parameter. One copy of test results in electronic format accompanied with the software from the test equipment manufacturer to view and update test results must also be included.
6. Include proof of calibration for all copper and fiber test equipment.

1.4 QUALITY ASSURANCE

A. This contractor shall be a firm that specializes in this type of work and shall, upon request, provide documentation of a minimum of three other successfully completed projects of similar size and magnitude that they are responsible for completing.

B. On the date of document issue, this contractor shall be a certified installer by:

1. AFL.
2. Belden.
3. CCT.
4. CommScope, Inc.
5. HellermannTyton
6. Hitachi Cable America, Inc.
7. Hubbell Premise Wiring, Inc.
8. Leviton Network Solutions.
9. Optical Cable Corporation.
10. Ortronics, Inc.
11. Panduit Corporation, Network Systems Division.
12. Siemon Company.
13. Signamax Connectivity Systems.

C. This contractor and all employees working on the jobsite shall currently meet all manufacturer requirements for the provision of all equipment specified herein. This contractor shall provide certification that all assigned staff have attended training courses corresponding to the types of cabling and installations specified herein.

D. This contractor shall be familiar with and utilize the following reference documents and codes throughout the course of equipment installation.

1. ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard and all addendums.
2. ANSI/TIA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components and all addendums.
3. ANSI/TIA/EIA-568-B.3 Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components Standard and all addendums.
4. ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces.

5. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
6. BICSI Telecommunications Distribution Methods Manual, most recent edition.
7. BICSI Telecommunications Cabling Installation Manual, most recent edition.
8. NFPA-70 National Electrical Code, most recent adopted edition.
9. NECA/BICSI-568-A Standard for Installing Commercial Building Telecommunications Cabling.
10. Federal Communications Commission Part 15 and Part 68.
11. UL 444 – Standard for Safety of Communications Cable.
12. UL 1666 – Standard for Safety of Flame Propagation Height.
13. NFPA 262 – Flame Travel and Smoke of Wires and Cables.
14. Any additional requirements of the Local Authority Having Jurisdiction.

E. This contractor shall utilize and have operators trained in the utilization of the following test equipment:

1. Copper Cable Test Equipment

    a. Fluke DTX 1800 or DSX 8000, or approved equal.
    b. WireXpert 4500, or approved equal.

2. Fiber Optic Cable Test Equipment

    a. Tektronix OTDR-OF-150, HP-E6000A OTDR, or approved equal.
    b. WireXpert 4500, or approved equal.
    c. AFL FlexScan FS200 SM, AFL FlexScan FS300 Quad MM/SM, or approved equal.
    d. AFL SMLP 5-5 Power Meter & Light Source Kit, or approved equal.

F. All products provided as part of this project shall be manufactured by firms experienced in manufacturing components listed under ANSI/TIA/EIA 568-B.2 and whose products conform to the standards of this specification.

G. 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.

1.5 COORDINATION

A. Coordinate Work of this Section with Owner's telephone switch, telephone instrument, workstation, and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with representatives of above organizations and Owner's representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute record to other participants.
3. Adjust arrangements and locations of distribution frames, patch panels, and cross connects in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of the telephone switch and LAN equipment.

B. Coordinate Work of this Section with the owner for wireless access points (WAPS).
   1. Provide two category 6 data cables (unless noted otherwise on the drawings) to each WAP location shown on the power and signal plans, coordinate terminations with the owner, typically leave 15' of cabling coiled up at the WAP location.
   2. Cables associated with WAP's shall be terminated at the "MDF" or "IDF's" on separate patch panels from cables associated with communications outlets or cameras.
   3. This contractor shall install the owner furnished WAP's.

1.6 MAINTENANCE/WARRANTY

A. Provide service and maintenance of cabling system for one year from date of substantial completion.

B. Provide a warranty for the system (including complete horizontal channels) against malfunction due to component failure or improper installation for a period of fifteen years from date of substantial completion. When notified of a malfunction, proceed to immediately correct the situation by replacement of repair, without cost to the Owner. Clearly indicate provisions of the warranty in the shop drawing submittals and maintenance manuals.

C. Within the warranty period, the contractor shall repair or replace any defective system components within 48 hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Cable products:

      a. AFL.
      b. Belden.
      c. Berk-Tek, Inc.
      d. CCT.
      e. Chatsworth.
      f. CommScope, Inc.
      g. General Cable.
      h. HellermannTyton.
      i. Hitachi Cable Manchester.
      j. Mohawk/CDT.
      k. Optical Cable Corporation.
      l. Corning.
      m. Superior Essex.

2. Connectors, distribution racks, modular jacks, wall plates, patch panels, cable management products, etc. shall be to the greatest extent possible, of one of the following manufacturers:

    a. AFL.
    b. Basor.
    c. Belden.
    d. CommScope, Inc.
    e. Cooper B-Line
    f. Great Lakes Case & Cabinet Company, Inc.
    g. HellermannTyton.
    h. Hoffman.
    i. Hubbell Premise Wiring, Inc.
    j. Leviton Network Solutions.
    k. Optical Cable Corporation.
    l. Ortronics, Inc.
    m. Panduit Corporation, Network Systems Division.
    n. RLX.
    o. Siemon Company.
    p. Signamax Connectivity Systems.

3. Innerduct:

    a. Carlon
    b. Endot Industries
    c. Pyramid

2.2 SYSTEM REQUIREMENTS

A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, all patch panels, cross connects, terminal strips, trays, wireways, equipment racks, etc. shall be sized to accommodate 20 percent future increase in active workstations.

1. Coordinate the location of the patch panel expansion capability with the owner.

2.3 MOUNTING ELEMENTS

A. Raceways and Boxes: Comply with Division 26 Section "Raceways and Boxes."

B. Backboards: 3/4-inch (19-mm) interior-grade, fire-resistive-treated plywood.

C. Distribution Racks: Provide freestanding rack(s), as appropriate for the application, and be modular-steel units designed specifically for attachment of telecommunications terminal support equipment.

1. Racks shall be designed to accommodate TIA/EIA standard rack mount equipment.
2. Free standing racks shall be approximately 78 inches high by 19 inches wide. Finish in black powder coat baked finish
3. Provide vertical (front and rear on each side of rack extending from floor to top of rack) and horizontal (2 rack space unit between each patch panel) cable management channels.

2.4 WIRE MANAGEMENT

A. Jumper Troughs:

1. Furnish and install 110 jumper troughs for management of terminal block patch cords and jumper wires, two per terminal block.

B. Patch Cord Organizer:

1. Furnish and install 110 patch cord organizers for management of terminal block patch cords and jumper wires, two per patch panel.

C. Wire Distribution Spools:

1. Furnish and install wire distribution spools for management of terminal block jumper wires, quantities as required.

D. Wire Hanger Assembly:

1. Furnish and install wire hanger assemblies for management of patch cables, four per backboard.

E. Cable Hangers:

1. Furnish and install “j-hook” cable hangers that are a minimum of one inch wide and be spaced no more than four feet on center.

2.5 COPPER CONNECTS AND TERMINAL EQUIPMENT

A. Patch panels (data, voice, and camera terminations) shall be modular and designed to accommodate the mounting of multiple numbered jack units. Connectors of the category 6 IDC type, at each jack, are to be used to terminate all wires of each arriving cable. Provide a jack for every arriving cable, plus spares as elsewhere required. Data, voice, and camera cables shall be terminated on separate patch panels.

1. Mounting: Rack.

B. Patch panels (WAP terminations) shall be modular and designed to accommodate the mounting of multiple numbered jack units. Connectors of the category 6A IDC type, at each jack, are to be used to terminate all wires of each arriving cable. Provide a jack for every arriving cable, plus spares as elsewhere required. Rack mounted.

C. Jacks and jack assemblies for UTP (data, voice, and camera) cables shall be category 6 jack modules, modular, color coded, RJ45 type receptacles, with integral IDC type terminals (clips).

1. Jacks shall conform to the performance standard set for in EIA standards and shall have been tested in accordance with TIA/EIA 568-B.2 standard. Jacks shall be durable enough to withstand 2,500 (minimum) insertions and withdrawals of a mating plug, without jack failure or degradation of the connection, as defined in IEC 603-7.

D. Jacks and jack assemblies for UTP (WAP) cables shall be category 6 jack modules, modular, color coded, RJ45 type receptacles, with integral IDC type terminals (clips).

1. Jacks shall conform to the performance standard set for in EIA standards and shall have been tested in accordance with TIA/EIA 568-B.2 standard. Jacks shall be durable enough to withstand 2,500 (minimum) insertions and withdrawals of a mating plug, without jack failure or degradation of the connection, as defined in IEC 603-7.

E. Patch panel patch cords shall be category 6, 4 pair cables in required lengths, not to exceed 5 meters in length, and shall be of the same manufacturer as other connectivity components in the system. Furnish as UTP and STP, as required. Plug connectors must be designed to properly mate with the jacks being installed. Provide one patch cord for every patch panel data jack in the facility.

F. Communications outlets (as designated by a half filled/half open triangle on the drawings) shall consist of multi jack/connector assemblies mounted in single gang faceplates. Outlets shall be equal to Siemons CT4 series plastic faceplates in white finish with designation labels and covers, provide space for two couplers. Couplers shall be equal to Siemons CT series angled coupler assemblies in white finish (flat couplers shall be used for communications outlets located in ceilings and floor boxes). Unless noted otherwise on the plans, all communications outlets shall be equipped with a category 6 double jack coupler, equal to Siemons CT-6 series, with two data cables (2D) and a voice jack coupler, equal to Siemons CT-6 series, with one voice (1V) cable to the nearest MDF or IDF location.

1. Typical Legend: Factory label top left jack (white), "Data"; top right jack (white), “Data”; bottom left jack (blue), “Voice”; bottom left jack (if required) (white, blue, or red), “Data”, Voice”, or “Fax” as required for the application.

G. Where wall mount telephone outlets are to be installed, the associated wall jack assemblies shall be of stainless steel design and utilizing binder screws to capture the wires and metal stud posts to hold the wall mount phone in place. Wall mount telephone outlets shall be provided with one voice jack matching other jacks in the facility and one associated voice cable (1V) to the nearest MDF or IDF location unless noted otherwise.

2.6 UTP/STP COPPER CABLES

A. All communications (data, voice, and WAP) cables shall be listed in compliance with category 6 TIA/EIA-568-B.1 standards. Manufacturer test results shall certify compliance with this standard.
1. All data and voice cable colors shall be blue.
2. All wireless access points (WAP’s) shall be yellow.

B. Conductors shall all be of solid copper.

C. Unshielded Twisted Pair (UTP) Cable shall be multipair, 24 ga., color coded, thermoplastic-insulated conductors in a PVC jacket.

D. Where required to comply with building and life safety codes, cables shall be rated for use in a Plenum environment. Features to remain as previously described, except that jacket materials are to be modified to attain the proper listing for the cable.

E. Provide 4 pair category 6 cables for all runs to communications outlets, WAP's, and wall mount telephone outlets.

1. Provide 20' of cable coiled up at each WAP location and each cord drop location minimum.

F. Provide 6-strand multi-mode fiber and (4) Category 6 cables between MDF and IDF's.

G. Whenever cabling is routed under grade with each end of the raceway rising to finish floor elevation, cabling must be wet location listed.

2.7 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

A. Cables: Factory fabricated, jacketed, low loss, glass type, fiber optic, multi-mode, graded index, operating at 850 and 1300 nm, and be laser optimized with aqua jacket.

1. Backbone, Strands per Cable: 6, unless otherwise indicated.
2. Dimensions: 50-micrometer core diameter, 125-micrometer cladding diameter.
3. Maximum Attenuation: 3.5 dB/km at 850 nm; minus 1.5 dB/km at 1300 nm.
4. Minimum Modal Bandwidth: 2000 MHz/km at 850 nm; 500 MHz/km at 1300 nm.
5. Rated for 10 GBPS Ethernet at 300 meters for both 850 nm and 1300 nm.
6. Operating Temperature Range: Minus 20 to plus 70 deg C.
7. Whenever cabling is routed under grade with each end of the raceway rising to finish floor elevation, cabling must be wet location listed.
8. Outdoor Installation: Loose tube design with water blocking.

B. Plenum Cable: Listed for use in plenums.

C. Cable Connectors: Quick-connect, simplex- and duplex-type LC couplers with self-centering, axial adaptor mechanisms. Insertion shall not exceed more than 0.75 dB per mated pair.

D. Patch Panel: Modular panels housing multiple-numbered duplex cable connectors.

1. Permanent Connection: Permanently connect one end of each connector module to installed cable fiber.
2. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.
3. Mounting: Rack. Mount above eye level.

E. Patch Cords: Dual fiber cables in required lengths. Provide one patch cord for every cabled jack in the facility.

1. Terminations: Two duplex connectors arranged to mate with patch-panel connectors, one at each end of each fiber in cord.

2.8 INNERDUCT

A. Furnish and install plenum rated innerduct, sized for the application, for protection of all fiber optic backbone data cabling, quantities as required. Armored MIC fiber cables may be used in place of innerduct type installation.

2.9 LIGHTNING PROTECTION

1. All conductive communications cables that exits one building and arrives at a separate building shall be protected on all leads and on both ends against lightning and over current, utilizing ground protection and sneak circuit protection devices, as appropriate for the application.
2. Protection of devices connected to incoming and outgoing cables shall be provided in the form of gas tube protectors at each end of every wire in the cables.
3. Typical protection modules shall be housed in a telecommunications block with 66 or 110 type punch down IDC terminals on the input and output of the block. The protectors shall be configured to be able to isolate the circuit from protection by pulling the gas tube out halfway from the normally fully inserted position.
4. The protection block shall have a grounding lug that is connected to the ground buss specified in the section via #10AWG stranded copper wire.

2.10 IDENTIFICATION PRODUCTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods" and the following:

1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.
2. Machine generated labels shall likewise be applied to all faceplates, patch panels, and other locations, as appropriate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABLE APPLICATION

A. Backbone UTP Cable: (4) Category 6, 4 pair minimum, to be used in runs between equipment rooms and wiring closets (ie: MDF & IDF locations).

B. Backbone Fiber Cable: 6 strand (minimum) multi-mode for runs between equipment rooms and wiring closets.

C. UTP Cable for Horizontal Runs (Data, Voice, and WAP's): Category 6, 4 pair minimum, to be used in runs from communications outlets to wiring closets.

D. Cabling for Outdoor Locations: Shall be direct burial rated with applied flooding compound.

3.3 INSTALLATION

A. The installation shall be in accordance with the latest requirements of the NEC, State, and Local Codes, ordinances and regulations of any other governing body having jurisdiction along with meeting BICSI standards.

B. All equipment shall be installed in a neat and workmanlike manner and to the satisfaction of the Project Engineer.

C. Communications outlet raceway shall consist of 4" square backbox, single gang ring, and ¾" (minimum) conduit with insulated bushing to accessible ceiling space unless noted otherwise.

D. Wiring Method: Install wiring in raceway except within consoles, cabinets, desks, counters, accessible ceiling spaces, and in gypsum board partitions where "free air" cable wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and wiring except in unfinished spaces. All cabling routed at exposed ceiling structure in finished spaces shall be installed in raceway.

1. Whether system cabling is installed in cable tray or "free air", the system cabling shall be neatly run and shall be bundled separately from all other systems cabling.

2. Where cable is run "free air", the cable shall be rated for the intended use and shall be neatly run and supported, using acceptable means to ensure reliable installation and performance.
   a. Install cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
   b. Install sleeves for cable penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls. Provide insulated bushings for protection of conductors.
   c. Secure and support cable at intervals not exceeding 4 feet and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   d. Utilize cable distribution rings and hangers, standoffs, spools and other suitable devices as an aid in managing all cable runs. Where cable tray is not provided, cable distribution hangers shall be wall or ceiling mounted above accessible ceilings at varying 4 to 6 foot intervals. All cable hangers shall be self supporting and be attached to building structure.
   e. Cables shall not be laid on or draped across any ceiling tiles, grids, electrical or mechanical fixtures, raceways, piping, or ductwork. Maintain at least a 6 inch separation between the communications cables and fluorescent or HID lighting.
   f. Cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.
   g. Tie-wraps are not approved, where extra supports are needed for cable support, utilize Velcro strapping.

E. Install cable using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure category 6 performance of completed and linked signal paths, end to end.

F. All fiber-optic back-bone cabling shall be installed in innerduct unless armored MIC type fiber is used.

G. Install cable without damaging conductors, shield, or jacket.

H. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.

I. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

1. Pull cables simultaneously if more than one is being installed in the same raceway.
2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage media or raceway.

J. Cable Slack: Provide additional slack at both ends of cables to accommodate future cabling system changes. Include the slack length in all length calculations to ensure that horizontal cable does not exceed 295'.

1. Do not store slack cables in bundled loops. Store cable slack in an extended loop or in a figure 8 configuration to alleviate stress.
   a. The minimum amount of slack at the MDF and IDF locations shall be 10'.
   b. The minimum amount of slack at communications outlet locations shall be 1'.

K. Wiring within Wiring Closets: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

L. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

M. Use splice and tap connectors compatible with media types.

3.4 GROUNDING

A. Comply with Division 26 Section "Grounding."

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. To ensure proper grounding, provide a green #3/O insulated grounding conductor in raceway from grounding electrode system to the main distribution frame (MDF) location and #6 AWG insulated grounding conductor from the MDF to intermediate distribution frame (IDF) locations in a loop configuration. Bond the grounding bus at the MDF and IDF locations to structural steel, the nearest panelboard, and all telecommunications equipment racks. See the Telecommunications Grounding Detail on the drawings.

D. A ground buss bar shall be installed in each MDF and IDF. It shall have insulated standoffs and be pre-drilled with an array of ¼" holes. The MDF's buss bar size shall be ¼" x 4" x 14" and the IDF bus bars shall be ¼" x 2" x 7". All connections to the buss bars shall be made via non-reversible crimp style one or two hole connectors.

3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Line walls with ¾" plywood backboards. Paint backboards with two coats of grey fire retardant paint.

B. Mount patch panels, terminal strips, connecting hardware, and cable management equipment on backboards, unless otherwise indicated.

C. Group connecting hardware for cables into separate logical fields.

D. Use patch panels to terminate data and voice cables entering the space, unless otherwise indicated.

3.6 IDENTIFICATION

A. Identify system components complying with applicable requirements in Division 26 Section "Basic Electrical Materials and Methods", TIA/EIA-606 standard, and the following specifications.

B. System: Use a unique, three-syllable alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

1. First character identifies and locates wiring closet or equipment room where cable originates.
2. Second character identifies and locates cross-connect or patch-panel field in which cable terminates.
3. Third character designates the position occupied by the cable (and its pairs) in the field.
4. Subsequent characters to further describe the cable routing and destination, as deemed necessary.

C. Communications Outlet: Label jacks within outlets and cables within outlet boxes.

D. Distribution Racks and Frames: Label each unit and field within that unit.

E. Within Connector Fields, in Wiring Closets and Equipment Rooms: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.

F. Cables, General: Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

G. Cable Schedule: Post in prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Provide electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.

3.7 FIELD QUALITY CONTROL

A. Testing: On installation of cable and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed.

B. Test Reports shall be generated utilizing the compilation software provided as part of the test equipment package routinely included with current data communications test equipment.

C. Correct malfunctioning units at the Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

D. Test Equipment Criteria:

1. All category 6 field testing shall be performed with an approved level IV UTP/ScTP field test device.
2. All UTP/ScTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
3. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
4. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

E. Copper Cable Testing:

1. Category 6 Cable:
    a. Category 6 UTP/ScTP horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the permanent link, and 100 m (328 ft) for the channel shall be 100% tested according to ANSI/TIA/EIA-568-B.1.
    b. Test parameters include wire map plus ScTP shield (when present) continuity, length, NEXT loss (pair to pair), NEXT loss (power sum), ELFEXT loss (pair to pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.
    c. All UTP/ScTP backbone cables exceeding 90 meters shall be 100% tested for continuity.
    d. All installed channels shall perform equal to or better than the minimum requirements as specified below at the highest frequency:
        1) Frequency Range: 1-250MHz
        2) Insertion Loss: 36 dB
        3) NEXT Loss: 33.1 dB
        4) Power Sum NEXT Loss: 30.2 dB
        5) ELFEXT: 15.3 dB
        6) Power Sum ELFEXT: 12.3 dB
        7) Return Loss: 20.1 dB
        8) Propagation Delay: 546 ns

9) Delay Skew: 50 ns
10) ACR: -2.7 dB
11) Power Sum ACR: -5.7 dB

F. Fiber Optic Cable Testing:

1. Fiber optic cables shall be 100% tested for insertion loss and length.
2. Length shall be tested using an OTDR, optical length test measurement device, or sequential cable measurement markings.
3. Insertion loss shall be tested in at least one direction using the 1-jumper method.
4. Acceptable insertion loss test results shall be determined using the following calculation:
   a. Link Insertion Loss = cable attenuation + connector insertion loss + splice insertion loss
      1) Cable attenuation (dB) = attenuation coefficient (dB/km) x length (km).
      2) Connector Insertion Loss = .75dB.
      3) Splice Insertion Loss = .3 dB per splice.
5. Horizontal Fiber Testing: All installed channels shall perform equal to or better than the minimum requirements as specified below:
   a. Maximum Insertion Loss: 1.85 dB at 850 nm, 1.7 dB at 1300 nm.
   b. Minimum Return Loss: -45dB.
6. Backbone Fiber Testing: All installed channels shall perform equal to or better than the minimum requirements as determined from the above equation for the cable length installed.
   a. Multimode Cable:
      1) Maximum Insertion Loss at 2 km length: 8.5 dB (+ .3 dB per splice) at 850 nm, 4.5 dB (+ .3 dB per splice) at 1300 nm.
      2) Minimum Return Loss: -45dB.

3.8 ACCEPTANCE REQUIREMENTS

A. The contractor must warrant in writing that 100% of the installation meets the requirements specified.

B. The owner reserves the right to conduct, using contractor equipment and labor, a random re-test of up to 5% of the cable plant to confirm documented results. Any failing cabling shall be re-tested and restored to a passing condition. In the event more than 2% of the cable plant fails during re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the owner.

C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation as described in this specification.

3.9 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Train designated personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets. Provide a minimum of four hours training.
3. Review data in maintenance manuals. Include copies of all field tests and results. Test results shall show every termination point by identification number and list results of all tests performed. Identify every jack and outlet by name, cable ID, patch panel and crosspoint ID, as well as a description of the building location where the jack is located.
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 277400

SECTION 281500
INTEGRATED ACCESS CONTROL HARDWARE DEVICES

GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes access control door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:
   1. Electrified and Integrated Access Control Card Key Door Hardware.

C. Related Sections:
   1. Division 01 Section "General Conditions”.
   2. Division 06 Section “Rough Carpentry”.
   3. Division 06 Section “Finish Carpentry”.
   4. Division 08 Section “Operations and Maintenance”.
   5. Division 08 Section “Hollow Metal Doors and Frames”.
   6. Division 08 Section “Flush Wood Doors”.
   7. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   8. Division 08 Section "Door Hardware”.
   9. Division 08 Section “Automatic Door Operators”.
   10. Division 26 Section "Electrical”

D. Codes and References:
   1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
   2. IBC - International Building Code
   3. NFPA 70 (2002) - National Electrical Code.
   4. NFPA 80 (1999) - Fire Doors and Windows.
   5. NFPA 101 (2006) - Life Safety Code.
   6. UL 1076 - Proprietary Burglar Alarm Units and Systems.

E. Products installed but not provided under this Section include the following. Coordination to remain a requirement of this Section.
   1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.03 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. System Operational Descriptions: Complete system operational narratives for the integrated access-controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, 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 and firmware. 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.
2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
    1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.
    1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.
    1. ASSA ABLOY access control products are required to be supplied only through designated “Authorized Channel Partners.”
        a. List Qualified ACP Companies

C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:
    1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
    2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on

site consulting services for both electrified door hardware and integrated access control systems installations.

3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.
   1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."

E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator 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 integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
   1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
   3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
   4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
   5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Division 8 Section "Door Hardware".

H. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.
   1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
   2. Review and verify sequence of operation descriptions for each unique access controlled opening.
   3. Review and finalize construction schedule and verify availability of materials.
   4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.
   1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.06 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) 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.

1.07 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are 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 the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and 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. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):

1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer's version or for up to (2) years after a new version release.
1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.08 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 the installed access control system hardware and components.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.09 SCOPE OF WORK

A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:
1. Electrified integrated card reader locks and exit hardware, permanent and temporary override cylinders, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.
    a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
    b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.
2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the

network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.
   a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.
3. Owner to provide the following:
   a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
   b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
   c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.
   d. Network Control Processor Connections:
      1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
      2) Required static IP addresses.
4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.
7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
8. Electrical contractor, Division 26, to provide the following:
   a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
   b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
      1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
      2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
   c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
9. Access Control System Integrator to provide the following:
   a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels,

electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.

10. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
11. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
12. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
13. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
14. Electrical contractor (Division 26) to provide the following:
    a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
        1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
        2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
    b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
15. Access Control System Supplier to provide the following:
    a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access-controlled opening in accordance with applicable codes and specified system operational narratives.
16. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

PRODUCTS

2.01 INTEGRATED WIRED OUTPUT ACCESS CONTROL, MULTI-CLASS READER

A. Integrated Wired Output Multi-Class Mortise Locks: Wiegand or Open Supervised Device Protocol (OSDP) output ANSI A156.13, Grade 1, mortise lockset with integrated card reader with or without keypad option, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
    1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
    2. Integrated reader supports the following credentials:

a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant.
e. NFC-enabled mobile phones
f. PIN code only or PIN + credential with keypad option.

3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 500mA maximum and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
5. Support end-of-line resistors contained within the lock case.
6. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
7. Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
8. Manufacturers:
   a. Corbin Russwin (RU) - ML2000 SN Series.
   b. Sargent Manufacturing (SA) - SN200/SN210 8200 Series.
   c. Substitutions: 016000 - Product Requirements.

B. Integrated Wired Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader with or without keypad option, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
   1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
   2. Integrated reader supports the following credentials:
      a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
      b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
      c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
      d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
      e. NFC-enabled mobile phones
      f. PIN code only or PIN + credential with keypad option
   3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
   4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
   5. Competitor Alternates Allowed Option: Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
   6. Manufacturers:
      a. Corbin Russwin (RU) - ED5000 SN Series.
      b. Sargent Manufacturing (SA) - SN200/SN210 80 Series.
      c. Substitutions: 016000 - Product Requirements.

2.02 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.03 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

D. BHMA Designations: Comply with base material and finish as specified.

EXECUTION

3.01 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 of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.03 INSTALLATION

A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic integrated 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. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item 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.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.04 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.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.
   1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
   2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
   3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
   4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
   5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.05 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.08 ACCESS CONTROL HARDWARE SETS

A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, 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.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 281500

SECTION 287210 - FIRE ALARM SYSTEM

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 fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

B. Related Sections include the following:

1. Division 8 Section "Hardware" for door closers/holders/smoke detectors, electric door locks, and release devices that interface with fire alarm systems.

2. Division 21 for water flow devices and sprinkler valve-tamper devices.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. General: Noncoded, addressable system with manual and automatic alarm initiation; and multiplexed signal transmission dedicated to fire alarm service only.

B. Wiring Class and Style: Initiating device circuits and signaling line circuits shall be Class B.

1.5 SUBMITTALS, SHOP DRAWINGS & MAINTENANCE MANUALS

A. Submittals shall be provided in accordance with Division 1 and as further described herein.

B. Submittals shall include major equipment material lists, summarizing every item to be provided, by manufacturer, part number, quantity, and include a brief summary of each item. Manufacturer’s product data sheets, describing each of the major components shall also be provided.

C. Submittals shall be tab divided to aid in identifying the various sections of the submittal.

D. Shop drawings shall include complete floor plan drawings showing device locations, conduit routing, wire and cable quantity and sizes. Functional block diagrams, complete termination diagrams, showing all headend, control and typical field devices, shall also accompany the submittal.
   1. Battery: Provide battery sizing calculations for the control panel and each power expander for actual connected loads.
   2. Voltage Drop Calculations: Provide voltage drop calculations for all notification circuits.
   3. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

E. Maintenance manuals shall be compiled in accordance with the Division 1, shall include all information provided as part of the original submittal and shall also be updated to include installation notes, manufacturer's manuals, etc. Manuals shall also include:
   1. Descriptions of all equipment and normal operating procedures.
   2. Final shop drawings, updated to reflect "as-built" accuracy. Include outlets with label ID's, and cable designations and routing information.
   3. Field test reports shall be provided, indicating and interpreting test results for compliance with performance requirements of the Project. Provide certificate of completion in compliance with NFPA 72.
   4. Maintenance data shall be included for all major pieces of equipment, as per the requirements specified in Division 1.
   5. Copy of major equipment manufacturer's standard warranty statements, for future reference and use, should claims need to be submitted.

F. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals", make an identical submission (quantity as required by the AHJ) to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

1.6 QUALITY ASSURANCE

A. Product Quality
   1. Equipment described in this Section shall be provided by a company regularly engaged in the design, sale and installation of Fire Alarm Systems. This company shall also have a service organization, trained by the equipment manufacturer and located a reasonable distance from the jobsite, which is capable of maintaining the system once installed. The services of this company shall be retained by the Electrical Contractor to supervise the system design, installation, make final system connections, and perform all tests and balance work required.
   2. All basic electronic equipment shall be listed by Underwriter's Laboratories, Inc. for the application and shall be products of manufacturers of established reputation and experience.
   3. Obtain fire alarm system components through one source from a single manufacturer.

B. Contractor Qualifications
   1. The Installing Contractor shall be a firm specializing in the type of work called out in this specification section and shall, upon request, provide documentation that they have successfully completed at least three other installations of similar size and scope to this installation.
   2. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
   3. Comply with NFPA 72.
   4. The Installing Contractor (and any Subcontractors working for the Installing Contractor) shall be licensed, in accordance with local, regional and state authorities having jurisdiction, to complete the work that they are contracted to perform.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Edwards United Technologies.
   2. Faraday.
   3. Hochiki America Corporation.
   4. Gamewell/FCI.
   5. Notifier; Div. of Pittway Corp.
   6. Siemens.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

E. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

F. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

G. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

H. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a smoke (duct type smoke detector shall result in either an alarm or a supervisory condition as required by the AHJ) or flame or heat detector, or operation of a sprinkler flow device initiates the following:

1. Notification-appliance operation.
2. Identification at the FACP and the remote annunciator of the device originating the alarm.
3. Transmission of an alarm signal to the remote alarm receiving station.
4. Unlocking of electric door locks in designated egress paths.
5. Release of fire and smoke doors held open by magnetic door holders.
6. Shutdown of fans and other air-handling equipment serving zone where alarm was initiated.
7. Closing of smoke dampers in air ducts of system serving zone where alarm was initiated.
8. Recording of the event in the system memory.

I. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

J. Sprinkler valve-tamper switch operation initiates the following:

1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event in the system memory.
4. Transmission of supervisory signal to remote alarm receiving station.

K. (Where Applicable) Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system initiates the following:

1. A supervisory, audible, and visible "sprinkler trouble" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event in the system memory.
4. Transmission of trouble signal to remote central station.

L. Removal of an alarm-initiating device or a notification appliance initiates the following:

1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
2. Recording of the event in the system memory.
3. Transmission of trouble signal to remote alarm receiving station.

M. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.3 MANUAL PULL STATIONS

A. Description: Fabricated of metal or Lexan, and finished in red with molded, raised-letter operating instructions of contrasting color.

1. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm. Break glass stations are not acceptable.
2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
3. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

2.4 SMOKE DETECTORS

A. General: Include the following features:

1. Operating Voltage: 24-V dc, nominal.
2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
5. Sensitivity: Can be tested and adjusted in-place after installation.
6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
7. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

B. Photoelectric Smoke Detectors: Include the following features:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detector: Photoelectric type.

1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.
2. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.5 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

1. Mounting: Plug-in base, interchangeable with smoke detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.6 PROGRAMMER/TESTER

A. Provide one programmer/tester for the owners use.
1. The addressable initiating device's programmer/tester accessory shall be capable of programming the device's address or testing the device for functionality. The unit shall be portable and shall contain standard, replaceable, rechargeable batteries.
2. The unit shall include a keyboard to allow for programming and testing devices, as well as allow for accessing special menu functions.
3. The unit shall incorporate a integral detector base for mounting devices.
4. The unit shall be provided with AC adapter for powering the unit and charging the batteries. A jack and receptacle for programming and testing manual stations, interface modules, monitor modules, etc.. shall be included in the unit
5. Provide a carrying case for the unit and accessories.

2.7 NOTIFICATION APPLIANCES

A. Description: Equip for mounting as indicated and have screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
2. Weatherproof where indicated.
3. Where shown to be ceiling mounted, units shall be listed for ceiling mount application.
4. Devices shall have white finish.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet (3 m) from the horn.

1. Horn audibility level shall be field selectable to suit conditions.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: As noted on the plans. If candela ratings are not noted on the plans, provide devices with candela ratings as required to provide for required visual notification.
2. Devices shall be synchronized as required by applicable codes.
3. Strobe Leads: Factory connected to screw terminals.

2.8 REMOTE DEVICE LOCATION-REMOTE TEST/INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: Remote test station with LED indicating light and remote test key switch near each smoke detector that may not be readily visible. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp and test switch are flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector is located.

2.9 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated. Provide catch plate extensions as required for holding door.
3. Rating: 24-V ac or dc.

B. Material and Finish: Match door hardware.

2.10 CENTRAL FACP

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.

1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch (25 mm) high. Identify individual components and modules within cabinets with permanent labels.
2. Mounting: Surface.

B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.

D. Minimum Number of Intelligent Detection Input Points: 150 or 125% of the connected addressable devices, whichever is greater.

E. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

F. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

G. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components, including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Display: Liquid-crystal type, 40 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

H. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.11 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.

1. Mounting: Flush cabinet, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.12 NOTIFICATION APPLIANCE CIRCUIT POWER EXTENDER PANEL

A. Provide additional panels as required for operation of notification appliances.
1. Panel shall provide synchronization of strobes at a rate of 1Hz and operate horns with a temporal code pattern.
2. Panel shall provide the capability to silence the audible signals, while the strobes continue to flash.
3. Panel shall provide the capability to synchronize multiple notification appliance circuits.
4. Provide monitor module for monitoring trouble contacts.

2.13 EMERGENCY POWER SUPPLY

A. General: Components include valve-regulated, recombinant lead acid battery; charger; and an automatic transfer switch.

1. Battery Nominal Life Expectancy: 4 years, minimum.

B. Battery Capacity: Comply with NFPA 72.

1. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.14 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.

2.15 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled under UL 864 and NFPA 72.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self Test: Conducted automatically every 24 hours with report transmitted to central station.

2.16 WIRE

A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation. Sized per manufacturer requirements.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. The installation shall be in accordance with the latest requirements of the NEC, State, and Local Codes, ordinances and regulations of any other governing body having jurisdiction

B. All equipment shall be installed in a neat and workmanlike manner and to the satisfaction of the Project Engineer.

C. Connect the FACP with a disconnect switch with lockable handle or cover.

D. Provide a smoke detector at the FACP and each notification appliance circuit signal power extender panel.

E. Manual Pull Stations: Mount semi flush in recessed back boxes.

F. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

G. Fire Department Connection: Provide a weatherproof audible/visual notification device at the fire department connection, coordinate location with the fire protection contractor.

H. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.

I. Wall-Mounted Smoke Detectors: At least 4 inches (100 mm), but not more than 12 inches (300 mm), below the ceiling.

J. Smoke Detectors near Air Registers: Install no closer than 36 inches.

K. Duct Smoke Detectors: Comply with manufacturer's written instructions.

1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
2. Install sampling tubes so they extend the full width of the duct.

L. Interface with Mechanical HVAC Equipment:

1. Coordinate with the mechanical contractor the zoning of smoke detectors for control of smoke dampers. Provide control outputs and relays and all required wiring for zoned control of smoke dampers as required for proper operation.
    a. Dampers shall be closed when the fire alarm system is in alarm condition and shall be opened when the system is in the normal condition.
    b. Any smoke dampers that are controlled with a duct smoke detector shall close when the associated HVAC equipment is not running. Obtain the signal from the building automation system that indicates the HVAC equipment is not running and

wire the dampers so that they close when the equipment is not running and open when the equipment is running. Coordinate requirements with the mechanical contractor.

2. Provide alarm output signals and wiring to the building automation system and all HVAC equipment motor starters and/or AFD controllers for fan shutdown upon alarm as required by the International Mechanical Code. Coordinate requirements with mechanical contractor.

M. Wall Mounted Audible Alarm-Indicating Devices: Install with top of device not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

N. Wall Mounted Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and with top of device at least 6 inches (150 mm) below the ceiling.

O. Visible Alarm-Indicating Devices in Sleeping Rooms: Install with top of device at least 24 inches below the ceiling.

P. Notification Appliance Circuits: Connected appliance load shall not exceed 80% of the allowable circuit load.

Q. Remote Device Location-Remote Test/Indicating Lights and Identification Plates: Provide for each smoke detector which is not readily visible and locate in public space near the device they monitor.

R. FACP: Mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor. Wiring splices shall not be made in the control panel enclosure.

S. Annunciator: Install with the top of the panel not more than 72 inches (1830 mm) above the finished floor.

3.2 WIRING INSTALLATION

A. Wiring Method: Install wiring in raceway except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces. All wiring installed underground or under slab shall be wet location listed.

1. Raceway and boxes shall be installed in accordance with Division 26 Section “Raceway and Boxes”.
2. “Free-Air” Cabling techniques are NOT acceptable for this project. All cables shall be in raceway.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction box covers red in non-public, un-finished spaces, and above accessible ceilings.

E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Basic Electrical Materials and Methods."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 COORDINATION OF CENTRAL REPORTING

A. Coordinate central reporting requirements and connections with the owner, telephone switch provider, and local utility.
   1. Ensure that arriving phone lines intended for connection for fire alarm central station reporting use are properly routed, terminated, and labeled at all points in this building.
   2. Where lines are to be “shared” use, wiring shall first route through the fire alarm system dialing equipment and then on to the telephone switch. Wire terminations through line seizure modules are to be made in a manner that ensures capture and use by the fire alarm equipment in an emergency.

3.5 GROUNDING

A. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

B. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 26 Section "Grounding."

C. Ground equipment and conductor and cable shields.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.7 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.8 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 for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 4 hours' training.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Owner, through Architect/Engineer, with at least seven days advance notice.

3.9 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to two requested visits to Project site for this purpose.

END OF SECTION 287210

SECTION 312316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

C. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Section 312323 - Fill: Fill materials, backfilling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for excavation.

1.04 REFERENCE STANDARDS

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

PART 3 EXECUTION

2.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

2.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

2.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
   1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.
   2. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:

2.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Cut utility trenches wide enough to allow inspection of installed utilities.
   4. Hand trim excavations. Remove loose matter.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

2.05 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

2.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

2.07 CLEANING

A. Stockpile excavated material to be re-used in area designated on site.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

2.08 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 312323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, and utilities within the building.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation: Removal and handling of soil to be re-used.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.04 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2025.

C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

1.05 DELIVERY, STORAGE, AND HANDLING

A. When fill materials need to be stored on site, locate stockpiles where directed by Engineer.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. As recomended in Soil Investigation Data.

2.02 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density: Specified or Indicated per the Geotechnical Exploration Report.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION