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 10 of the General Conditions for details.

PROJECT MANUAL

Willow Lake School Addition
Willow Lake School District 12-3
De Smet, SD

CO-OP PROJECT NO. 2153

CO
Arch
OP

LIQUIDATED DAMAGES

The anticipated construction schedule is as follows:

Commencement of Contract: **On or near March 13, 2023**
Commencement of Construction: **March 20, 2023**
Certificate of Substantial Completion: **Phase I- August 9, 2024; Phase II- May 16, 2025; Phase III- August 15, 2025**
Final Completion: **Phase I- August 20, 2024; Phase II- May 27, 2025; Phase III- August 26, 2025**

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

Phase I: ($500 per calendar day) from August 9, 2024 thru SUBSTANTIAL COMPLETION.
Phase II: ($500 per calendar day) from May 16, 2025 thru SUBSTANTIAL COMPLETION.
Phase III: ($500 per calendar day) from August 15, 2025 thru SUBSTANTIAL COMPLETION.

THE PENALTY 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:

7 working days beyond SUBSTANTIAL COMPLETION.

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

$200 PER DAY

THE PENALTY 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 AIR AND REASONABLE ESTIMATE OF THE DAMAGES SUFFERED BY THE OWNER IN THE EVENT OF SUCH BREACH.

WILLOW LAKE SCHOOL ADDITION
WILLOW LAKE SCHOOL DISTRICT 12-3
WILLOW LAKE, SD

CO-OP Architecture Project No. 2153
January 30, 2023

Project Contacts:

Architect: CO-OP Architecture
Mr. Jason Kann, AIA
440 East 8th Street #221
Sioux Falls, SD 57104
Ph: 605-334-9999

Landscape Architect: Confluence
Mr. Lyle Pudwill, ASLA, PLA
524 N Main Ave #201
Sioux Falls, SD 57104
Ph: 605-339-1205

Structural Engineer: RISE Inc
Mr. Justin Christensen, PE
6909 S Lyncrest Pl
Sioux Falls, SD 57108
Ph: 605-743-2510

Mechanical & Electrical Engineers: Sichmeller Engineering
Mr. Travis Sichmeller, P.E.
Mr. Josh Schroeder, P.E.
801 Railroad Ave. SE
Aberdeen, SD 57401
Ph: 605-225-4344

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NOTICE TO BIDDERS

Sealed bids will be received by the Business Manager on behalf of the Willow Lake School District, Willow Lake, South Dakota, at the Administration Office, 400 Garfield Avenue, Willow Lake, South Dakota 57278, for the **Willow Lake School Addition** until **1:00 p.m., local time on Thursday, February 23, 2023.** A pre-bid meeting will be held at the Concessions Area, 400 Garfield Avenue, Willow Lake, South Dakota 57278 at 1:00 p.m., local time on Thursday, February 9, 2023.

Copies of the Plans and Specifications will be made available electronically (pdf format) and printed at the bidder's own expense and at the exchanges listed below. Technical questions shall be directed to Levi Pfeil at CO-OP Architecture, LLC, Sioux Falls, South Dakota at 605-334-9999.

Aberdeen Builders Exchange Aberdeen, SD
Construction Industry Center, Rapid City, SD
Minnesota Builders Exchange, Minneapolis, MN
Plains Builders Exchange, Sioux Falls, SD
Sioux Falls Builders Exchange, Sioux Falls, SD

Bids shall be submitted to the Willow Lake School District in a sealed envelope with the name and address of the bidder clearly identified on the envelope and the words "Bid for Willow Lake School Addition". Faxed bids will not be accepted. Bids submitted via mail shall be sent to: Willow Lake School District 12-3, 400 Garfield Avenue, Willow Lake, South Dakota 57278. One combined bid will be accepted for complete construction (all material and labor) as required to provide a complete project.

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.

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 the Willow Lake School District; 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 the Willow Lake School District as a guarantee that such bidder will enter into a contract with the School District for the work described in the bid and as specified.

The Willow Lake School District reserves the right to accept or reject any or all bids and to waive any irregularities therein.

WILLOW LAKE SCHOOL DISTRICT of Clark County, South Dakota

By: Chris Lee
Superintendent

Please Publish: February 1st, 2023
February 8th, 2023

BID FORM

PROJECT: Willow Lake School Addition

TO: Willow Lake School District 12-3
400 Garfield Avenue
Willow Lake, South Dakota 57278

Bid of: _____
(hereinafter called "Bidder")

The Bidder, in compliance with your Advertisement for Bids for the Complete Construction (general, mechanical and electrical) work for the proposed building renovations, 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:

_____($_____)

Line Item #1 (to be included in Base Bid above): Temperature Control work required for addition and remodel areas.:

_____($_____)

Alternate No. 1: Operable Wall Partitions

(ADD) _____($ _____)

Alternate No. 2: Locker Room Area Expansion

(ADD) _____($ _____)

Alternate No. 3: Walk-off Carpet at Existing Vestibules

(ADD) _____($ _____)

Alternate No. 4: Playground Equipment and Surfacing

(ADD) _____($ _____)

Alternate No. 5: Poured-in-Place Playground Surfacing

(ADD) ($)

Alternate No. 6: Re-Installation of Existing Salvaged Playground Equipment

(ADD) ($)

Alternate No. 7: Temperature Control Work Required for the Remainder of the Existing Building that Remains.

(ADD) ($)

UNIT PRICES:

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

Item B – Imported and Compacted Fill $_____ Per CuYd

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)

DESCRIPTION OF ALTERNATES

ALTERNATE #1 – Operable Wall Partitions (Add Alternate)

As shown and indicated on the contract drawings, all necessary work to provide and install the operable wall partitions.

ALTERNATE #2 – Locker Room Area Expansion (Add Alternate)

As shown and indicated on the contract drawings, all necessary work to complete the work shown on Sheet A991 including all structural, mechanical, electrical, plumbing, etc.

ALTERNATE #3 – Walk-off Carpet at Existing Vestibules (Add Alternate)

As shown and indicated on the contract drawings, all necessary work to provide and install walk-off carpet at the existing vestibules.

ALTERNATE #4 – Playground Equipment and Surfacing (Add Alternate)

As shown and indicated on the contract documents, provide and install new play equipment, engineered wood fiber fill, separation fabric and pea gravel. Base bid shall include the concrete playground edge and infiltration trench.

ALTERNATE #5 – Poured-in-Place Playground Surfacing (Add Alternate)

As shown and indicated on the contract documents, provide and install pour-in-place permeable playground surfacing in lieu of engineered wood fiber fill. Alternate pricing shall include pour-in-place surfacing, as well as the concrete pad and aggregate base course. Cost should reflect a deduct for the engineered wood fiber fill, separation fabric and pea gravel, and infiltration trench.

ALTERNATE #6 – Re-Installation of Existing Salvaged Playground Equipment (Add Alternate)

As shown and indicated on the contract documents, re-install existing salvaged play equipment at approximate location indicated. Include additional concrete playground edge, engineered wood fiber fill, separation fabric and pea gravel, and infiltration trench.

ALTERNATE #7 – Temperature Control Work Required for the Remainder of the Existing Building That Remains. (Add Alternate)

As shown and indicated on the contract documents, provide and install temperature controls for replacement of the existing building areas controls.

AIA® Document A701™ – 2018

Instructions to Bidders

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

Willow Lake School
Willow Lake, South Dakota 57278

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

Willow Lake School District
400 Garfield Avenue
Willow Lake, South Dakota 57278
Telephone Number: (605) 625-5945

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

CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, South Dakota 57103
Telephone Number: (605) 334-9999

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

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

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: (1366521174)

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

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

Electronic Bid Documents are available through email. Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com. Bidding Documents are also available at the Building Exchanges as indicated in the Supplements to Instructions to Bidders.

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§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

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

Submit requests through email. Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com.

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

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

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

Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com to be added to the Bidder's List. Addenda will be issued electronically to the Bidders List and to the Building Exchanges as indicated in the Supplements to Instructions to Bidders.

§ 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.)

Reference the 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

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

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

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

§ 4.3 Submission of Bids

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

Reference the Notice to Bidders and Supplements to Instructions to Bidders.

§ 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.)

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ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

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

§ 5.2 Rejection of Bids

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

§ 5.3 Acceptance of Bid (Award)

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

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

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

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

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

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

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

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

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

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

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

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ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

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

§ 7.2 Time of Delivery and Form of Bonds

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(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 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

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.5 Drawings

Number	Title	Date
	Willow Lake School Addition	1/30/23

.6 Specifications

Section	Title	Date	Pages
	Willow Lake School Addition	1/30/23	

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

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

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 08:01:59 CT on 01/31/2023.

PAGE 1

Willow Lake School
Willow Lake, South Dakota 57278

...

Willow Lake School District
400 Garfield Avenue
Willow Lake, South Dakota 57278
Telephone Number: (605) 625-5945

...

CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, South Dakota 57103
Telephone Number: (605) 334-9999
PAGE 2

Electronic Bid Documents are available through email. Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com. Bidding Documents are also available at the Building Exchanges as indicated in the Supplements to Instructions to Bidders.
PAGE 3

Submit requests through email. Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com.
PAGE 4

Contact Levi Pfeil with CO-OP Architecture at levi@co-oparch.com to be added to the Bidder's List. Addenda will be issued electronically to the Bidders List and to the Building Exchanges as indicated in the Supplements to Instructions to Bidders.

...

Reference the Notice to Bidders.
PAGE 5

Reference the Notice to Bidders and Supplements to Instructions to Bidders.
PAGE 8

Willow Lake School Addition 1/30/23

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Willow Lake School Addition 1/30/23

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Jason Kann, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 08:01:59 CT on 01/31/2023 under Order No. 2114331755 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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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:

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, Mechanical & Electrical Construction

Project: Willow Lake School Addition

Location: Willow Lake, South Dakota

4.3.2. Bids will be received as follows:

Date: **February 23, 2023**

Time: **1:00 p.m.**

Location:

Willow Lake School District Administrative Offices

400 Garfield Avenue

Willow Lake, South Dakota

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)

Willow Lake School
Willow Lake, South Dakota 57278

THE OWNER:
(Name, legal status and address)

Willow Lake School District
400 Garfield Avenue
Willow Lake, South Dakota 57278

THE ARCHITECT:
(Name, legal status and address)

CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, South Dakota 57103

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

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

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

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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 Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

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

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

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delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

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§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

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ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

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§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

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promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

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or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

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approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

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§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

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§ 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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Additions and Deletions Report for

AIA® Document A201® – 2017

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

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PAGE 1

Willow Lake School
Willow Lake, South Dakota 57278

...

Willow Lake School District
400 Garfield Avenue
Willow Lake, South Dakota 57278

...

CO-OP Architecture
440 East 8th Street, Suite 221
Sioux Falls, South Dakota 57103

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Jason Kann, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 08:01:48 CT on 01/31/2023 under Order No. 2114331755 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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SUPPLEMENTS TO GENERAL CONDITIONS

AIA Document A-207-2017 "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.
2. Submittal Service: Submittal Exchange (1-800-714-0024) www.submittalexchange.com

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

11.1.1.2 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.

11.1.1.3 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.

11.1.1.4 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.

Soil Technologies, Inc.

28822 124th Street – Mobridge, SD 57601 – (605) 762-3406
www.soil-technologies.com

"Building Your Success On A Solid Foundation"

December 22, 2022

Willow Lake School District
c/o. Co-op Architecture
Attn: Levi Pfeil
440 E 8th St, Suite #221
Sioux Falls, SD 57103

Subj: Soil Exploration
Proposed School Addition
Willow Lake School
Willow Lake, SD
STI #22-1782

This report presents the findings of the Soil Exploration for the above referenced project. The exploration program was performed in accordance with your authorization of our proposal to you dated November 2, 2022, and its addendum #1 dated December 15th, 2022. An electronic file copy is being sent to you.

Soil Technologies, Inc. (STI) is dedicated to providing our clients with the most complete Soil Exploration and Geotechnical Engineering services. To accomplish this, a Geotechnical Engineer from Soil Technologies, Inc. should be retained to monitor the earthwork operations during construction. The Geotechnical Engineer will observe the soil conditions at the project site and judge when the excavations are satisfactorily completed. The Geotechnical Engineer's observations will help affirm that the earthwork is performed according to the recommendations of this report.

Thank you for the opportunity to perform these services for you on this project. If you have any questions regarding the contents of this report, or if we can be of further service to you, please feel free to contact us.

SOIL TECHNOLOGIES, INC.

Mr. Kim E. Stoecker, PE
President

REGISTERED PROFESSIONAL ENGINEER
6394
KIM E. STOECKER
SOUTH DAKOTA

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WILLOW LAKE SCHOOL DISTRICT
WILLOW LAKE, SD

SOIL EXPLORATION PROGRAM
PROPOSED SCHOOL ADDITION
WILLOW LAKE SCHOOL
WILLOW LAKE, SD

STI #22-1782

December 22, 2022

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Boring Location Drawing
Borings Logs
Field Exploration Procedures & "Descriptions"
Symbols and Terminology
Precautions…During Cold Weather
Construction Observation and Testing
Important Information about Your Geotechnical Report

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SOIL EXPLORATION PROGRAM
PROPOSED SCHOOL ADDITION
WILLOW LAKE SCHOOL
WILLOW LAKE, SD

STI #22-1782

1.0 INTRODUCTION

1.1 Project Information

We understand the proposed project will consist of the construction a building addition at the Willow Lake School in Willow Lake, SD. The proposed addition will consist of a single-story, slab-on-grade, heated structure and will include various classrooms, kitchen, etc. The building's overall dimensions are variable but are generally about 155 x 165 feet. The building structure will be supported on shallow spread footing foundations. A driveway/parking lot/playground area will also be part of the project.

- **Conditions:**

- The finished floor elevation of the proposed addition will match that of the existing school building and be at 100.0 feet.*
- The perimeter frost footings of the proposed addition will rest 4.5 to 6 feet below the finished floor and be at an elevation between 95.5 to 94.0 feet.*
- The new perimeter finished grades immediately surrounding the proposed addition will be below the finished floor elevation.
- Column loads will be a maximum of 125kips (total dead and live loads) with continuous footing loads less than 4 kips/ft (total dead and live loads).
- Uniform floor slab loadings exerted on the underlying soils will be a maximum 500 pounds per square foot (psf).

**Elevations based on the survey benchmark shown on the attached sketch.*

2.0 ENGINEERING REVIEW

The engineering recommendations provided in this report are based on the soil information obtained under this Soil Exploration Program along with the information and conditions of the project as described above. The recommendations are valid for the specific information and conditions listed. If there are additions, corrections, or changes to the above information or conditions, it is necessary that we be notified so that we can determine whether the new information or conditions affect our recommendations.

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Our design assumptions include a minimum theoretical safety factor of 3 with respect to shearing or base failure of the foundations. We assume an allowable total settlement of 1 inch and a differential settlement of up to ½ inch over a length of 30 feet.

The recommendations in this report assume the location of the proposed building addition is within 50 feet of the boring locations as shown on the attached sketch. If the location of the proposed building is changed so as not to be within this distance for each of the respective borings, we must be contacted for additional review and potentially additional borings.

2.1 Discussion

- **Soil Profile**

The boring logs suggest that the general soil profile in the area of the proposed structure consists of about 1.5 to 4.5 feet of clay "fill" soils and clay "topsoil" overlying native clay "alluvium" (water deposited soils) to depths of about 4 to 11 feet below the existing grades. The native clay "alluvium" is underlain by native clay "till" (glacial deposited soils) which extends to the termination depths of the borings at 15.5 feet below the existing grades. Please see Figure #1 below and the attached boring logs.

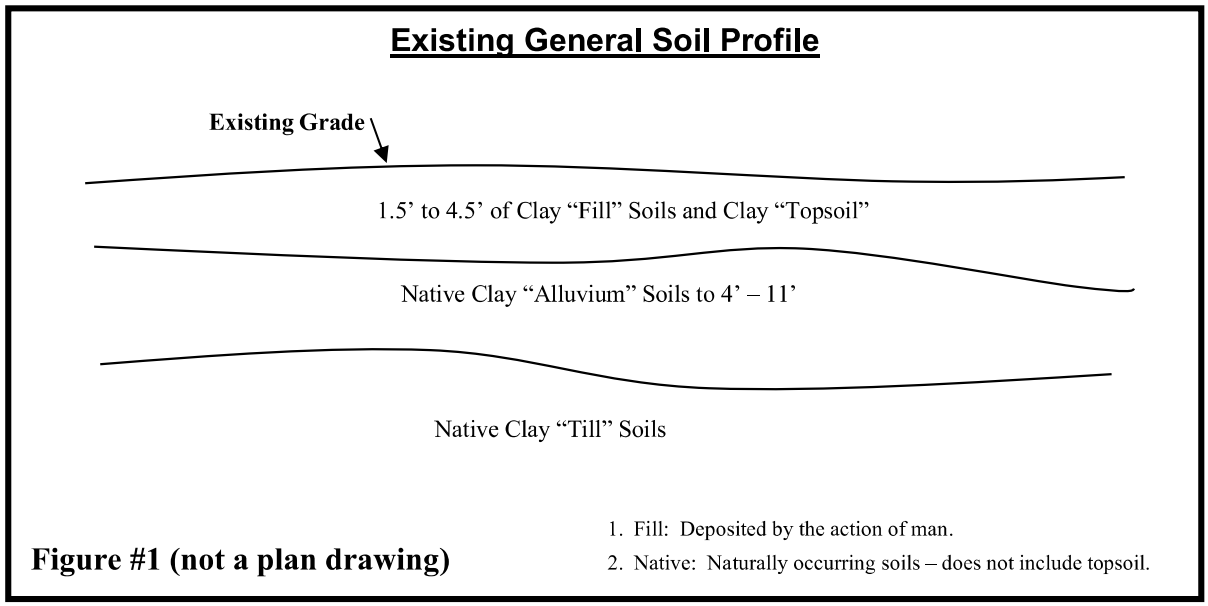


Figure #1 (not a plan drawing)

Note: The existing "fill" soils are assumed to be "undocumented" and thus, they are considered uncontrolled fill that was not monitored nor tested for quality and compaction during placement.

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- **General**

Based on the subsurface conditions encountered at the boring locations, it is our opinion that the native soils at the site will support the proposed structure on shallow spread footing foundations, provided the recommendations in this report are performed and the estimated settlements are acceptable. Listed below are some of the more prominent site conditions.

- **FOOTING AREAS**: Based on the borings, "fill" soils and "topsoil" exist at the site and extend from the surface to depths of about 1.5 to 4.5 feet below the existing grades. In our opinion, these soils are not suitable for support of the footings and should be removed from the footing areas. However, the native clay "alluvium" or "till" soils below the "fill" soils and "topsoil" can be used for support of the footings.
- **FLOOR AREAS:** Similar to the footing areas, the "fill" soils and "topsoil" are not suitable for support of the floors and should be removed from the floor areas. However, the native clay "alluvium" soils below the "fill" soils and "topsoil" can be used for support of the floor slabs.
- **SOIL DISTURBANCE:** The clay soils encountered at the site are sensitive to disturbance and care must be taken to not disturb them. If they become disturbed, they must be replaced with engineered fill or recompacted in-place and density tested.

2.2 Site Preparations

FOOTINGS (Interior, Exterior, & Thickened Edged): In our opinion, the existing "fill" soils and "topsoil" should not be used for support of the footings. Thus, site preparations in the footing areas should consist of the excavation of the existing "fill" soils and "topsoil" to expose the underlying competent native clay "alluvium" or "till" soils. Based on the boring logs, the "fill" soils and "topsoil" extend to depths of about 1.5 to 4.5 feet below the existing grades.

During the footing area excavations, the exposed native soils at the bottom of the excavations should be observed by STI's on-site Geotechnical Engineer. Shallow hand auger borings should be performed by the Geotechnical Engineer. Soft, sheared, disturbed, loose, or otherwise weak soils should be excavated as directed by the Geotechnical Engineer. Upon the Geotechnical Engineer's observation and approval of the exposed native clay soils, the footings can then be constructed to rest on the competent native clay "alluvium" or "till" soils, or they can rest on engineered fill soils (soils that have been compacted and tested to a specified density) placed above the native clay soils. Refer to engineered fill recommendations on pages 8-9.

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NOTE: Large column pads placed next to the existing footings may require an alternate foundation system such as helical piers to avoid undermining the existing footings during excavation for the new footings. Also, if the size of a column pad is controlled by uplift, please contact us for a possible revised excavation depth and allowable soil bearing pressure for the column pad.

The approximate minimum recommended footing and floor area excavation depths and corresponding elevations at each boring location are shown in Table 1 below. They are also noted on each of the attached boring logs. Also, refer to Figure #2 on page 5 showing "Typical Building Site Preparations." Please note that the on-site Geotechnical Engineer may require the footing and floor excavation depths to be significantly different at other locations at the site.

FLOOR SLAB: Similar to the footings, it is our opinion that the existing "fill" soils and "topsoil" should not be used for support of the floor slabs. Therefore, we recommend that site preparations for the floor slab areas also consist of excavating the existing "fill" soils and "topsoil" to expose the underlying native clay "alluvium" soils at the same minimum depths for that of the footings as shown in Table 1 below. The floor excavation depths are also noted on each of the attached boring logs. Please note that the on-site Geotechnical Engineer may require the floor excavation depths to be significantly different at other locations at the site.

TABLE 1 – FOOTING AND FLOOR AREA EXCAVATIONS

Boring #	FOOTING AND FLOOR AREA EXCAVATION DEPTHS Minimum Depths of Excavation Below Existing Grade (Feet)	FOOTING AND FLOOR AREA EXCAVATION ELEVATIONS Corresponding Minimum Excavation Elevations (Feet)*
1	1.5	98.0
2	3.0	97.2
3	3.5	96.8
4	2.0	98.3
5	2.5	98.2
6	4.5	96.3
7	2.5	98.4
8	2.0	98.9
9	2.0	98.8

**Elevations based on the survey benchmark shown on the attached sketch.*

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During the floor area excavations, the exposed soils at the bottom of the excavations should be observed by STI's on-site Geotechnical Engineer. Shallow hand auger borings should be performed by the Geotechnical Engineer. Soft, sheared, disturbed, loose, or otherwise weak soils should be excavated and replaced with engineered fill as directed by the Geotechnical Engineer. Upon the Geotechnical Engineer's observation and approval of the exposed soils, at least 12 inches of granular engineered fill should be placed above the exposed soils to meet the design floor grade elevation. Refer to the engineered fill recommendations listed on pages 8-9. (Note: Engineered fill depths more than 12 inches below the floor can consist of either granular (sand) or clay engineered fill.) Also, refer to Figure #2 below showing the "Typical Site Preparations."

Typical Building Site Preparations

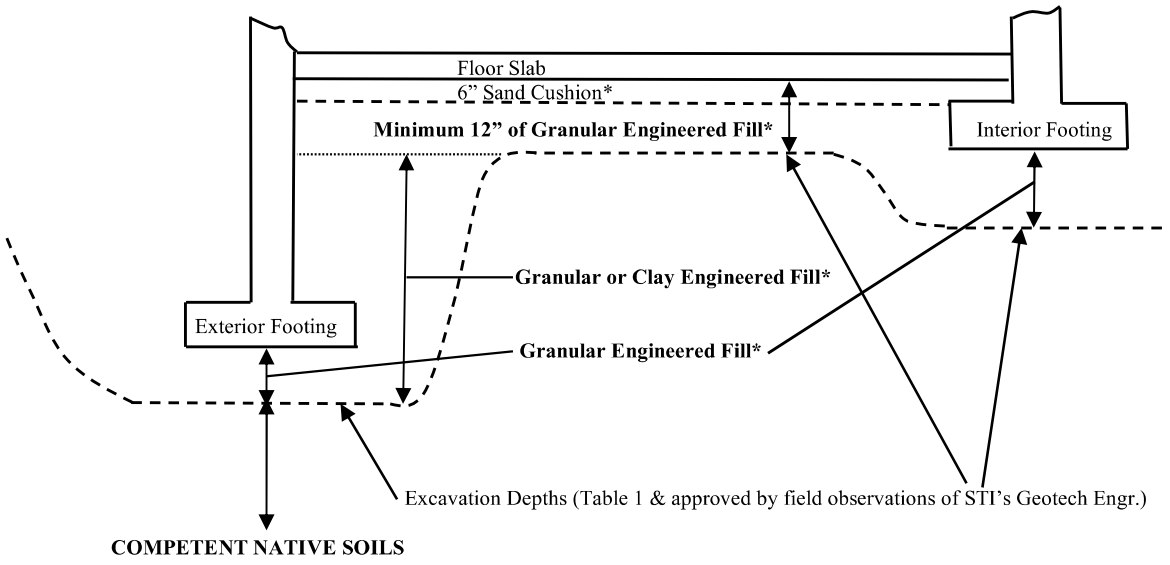


Figure #2 (not a plan drawing)

*Specific specifications listed in this report.

- **Polyethylene Vapor Membrane (Slab-on-grade)**

We recommend that consideration be given to placing a polyethylene vapor membrane (retarder) beneath the floor slab, especially if there are areas where moisture sensitive floor coverings are planned. If used, consideration should be given to the potential of curling of the concrete floor due to the presence of the membrane. Placing the membrane at least 2 inches beneath the surface

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of the sand cushion can help to minimize the potential for curling of the concrete floor. The use and placement of the membrane should be decided by the architect or structural engineer of record. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

- **Subgrade Modulus**

Placement of engineered fill soils from the bottom of the excavation to the design slab elevation will generally increase the overall modulus. The amount of increase is dependent on the type and depth of engineered fill placed. A granular engineered fill would generally provide a higher modulus than clay engineered fill. For design purposes, we have provided estimated subgrade modulus ("K") values as listed below in Table 2. The subgrade modulus values are assumed to be at the surface of the described soil type compacted to at least 95% of the Standard Proctor density (ASTM: D698). Please note that these values are only estimates based on soil types and densities. "Plate Load Tests" should be performed to provide specific "K" values.

TABLE 2

Soil Type (Minimum 95% Compaction) and/or approved by the on-site Geotechnical Engineer)	**Depth of Engineered Sand Soils**	**Estimated Subgrade Modulus (pci)***
Engineered Sand Soils over Lean Clay Soils	6" to 9"	130
Engineered Sand Soils over Lean Clay Soils	9" to 12"	170
Engineered Sand Soils over Lean Clay Soils	15" to 18"	200
Engineered Sand Soils over Lean Clay Soils	More than 20"	230

*Values should be reduced (up to 40%) for exterior pavements used for traffic during frost melting periods.

- **Frost Movement Below Slabs**

The existing native clay soils likely have moderate susceptibility of frost related movement. This frost related movement can cause distress to unprotected structural units or slabs. Thus, if limited frost movement is desired below movement sensitive surfaces, such as unheated interior or exterior slabs, significant depths (at least 36") of free-draining granular fill having less than 12% passing the #200 sieve should be placed for their support. Also, please refer to "Exterior Movement" on page 21 for additional information.

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- **Excavation Oversize Requirements**

Engineered fill placed below the footings should be oversized one foot laterally for each foot of fill placed below the footings (extend the excavation outwards from the outer edges of the footings a distance of 1 foot for every 1 foot of fill placed below the footings). The maximum lateral over-excavation required is 1.5 times the width of the footing. Please see Figure #3 below illustrating the 1:1 excavation oversize requirement.

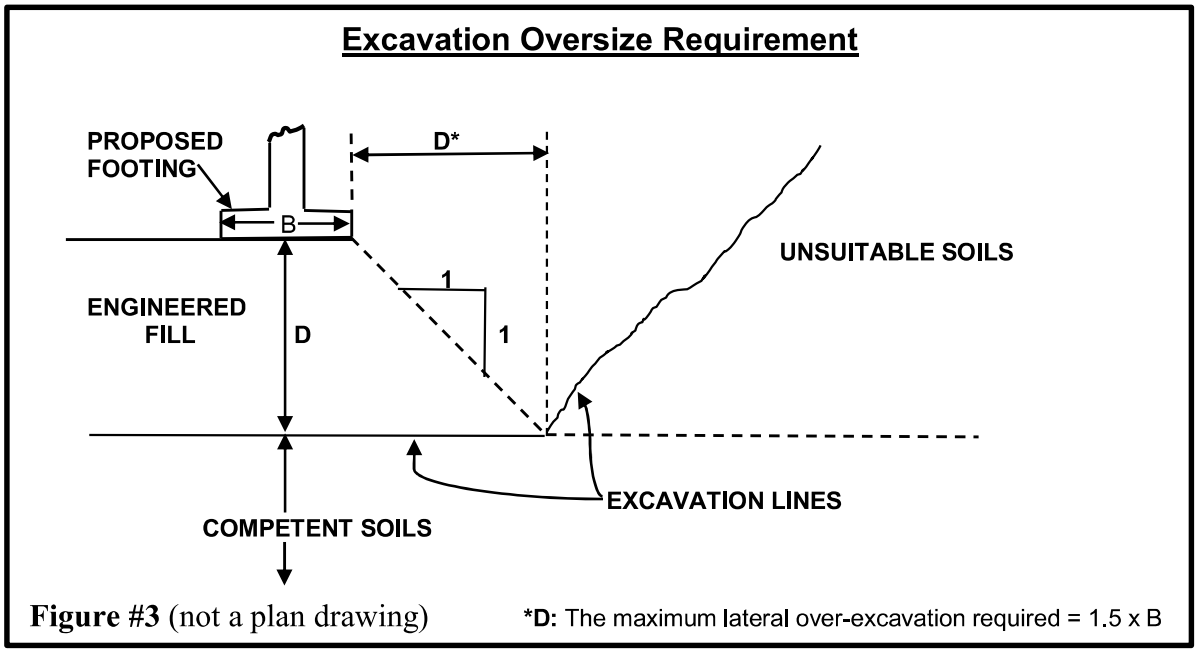


Figure #3 (not a plan drawing) ***D:** The maximum lateral over-excavation required = 1.5 x B

- **Utility Trenches**

Utility trenches within the building footprint (and in structural areas outside the building footprint) should be refilled with engineered fill. The engineered fill should be compacted and tested to the specified density listed on page 9. In addition, utility trenches should not be placed within the influence zone of the footings, including the influence zone of thickened edge footings. Please see Figure #4 below. If it is necessary to install a utility by crossing beneath an existing footing (new or old), that portion of the utility trench below the existing footing should be refilled with a lean concrete mix (flowable fill).

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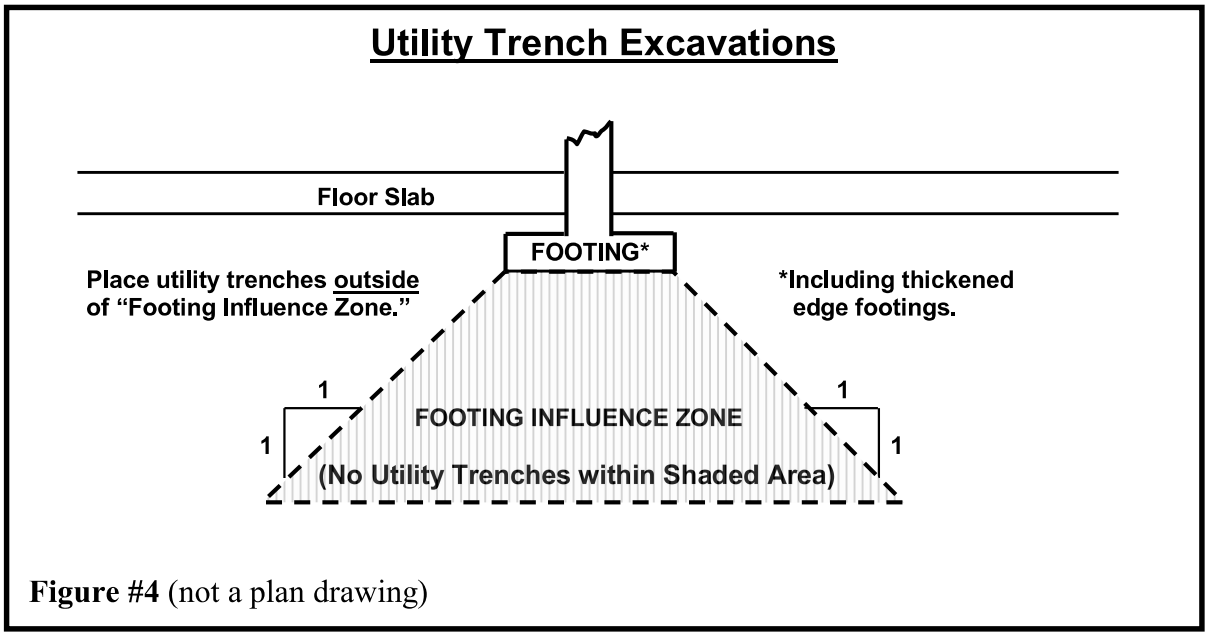


Figure #4 (not a plan drawing)

- **Engineered Fill - Foundation and Floor Areas**

We recommend the following types of engineered fill and compaction of engineered fill.

NOTE: Soils are classified as sand if more than 50% (by weight) is retained on the #200 sieve.

Below the footings:	**If moist to dry soil conditions exist in the excavation:** Use a granular engineered fill such as a pit run or processed sand or sand with gravel (SP, SW, SM, and SC). The pit run and processed sand should have a maximum gravel/cobble size of 3 inches and less than 15% passing the #200 sieve. **If wet or saturated soil conditions exist in the excavation:** A clean and medium to coarse grained sand or sand with gravel (SP or SW) will likely be required until at least 2 feet above the wet or saturated soil level in order to achieve the required compaction. The clean sand should have a maximum gravel/cobble size of 2 inches, a maximum 40% passing the #40 sieve, and less than 5% passing the #200 sieve. A 6 to 10-inch layer of ½"or less rock can be placed at the bottom of the excavation for stabilization purposes.
Above the footings and more than 12 inches below the bottom of the floor slab (including utility trenches):	**If moist to dry soil conditions exist in the excavation:** Use either a pit run or processed sand or sand with gravel (SP, SW, SM, and SC) or a non-organic and non-expansive lean clay (CL). The pit run and processed sand should have a maximum gravel/cobble size of 3 inches. The clay should have a liquid limit of less than 45. **NOTE the following:** - The on-site, non-organic lean clay soils (brown) are acceptable as CL engineered fill. - Organic soils (topsoil) should not be used for engineered fill.

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From 6" to at least 12 inches below the bottom of the floor slab:	In moist to dry excavations, use a pit run or processed sand or sand with gravel (SP, SW). The pit run and processed sand should have a maximum gravel/cobble size of 2 inches and less than 12% fines passing the #200 sieve.	
6-inch or more sand cushion below floor slab (capillary break):	The final 6" or more of engineered fill (fill directly beneath the floor slab) should consist of free draining sand (SP or SW) having a maximum gravel size of 1" and with less than 10**%** passing the #200 sieve by weight. The purpose of the sand cushion is to provide a working surface for the placement of concrete and also to serve as a capillary barrier.	
Compaction of engineered fill: (Less than 6 feet total thickness)	- Below Footings and in the footing influence zone (pg. 7): - Below Floor Slabs: - Utility Trenches (inside & within 10' outside of the building):	**Minimum % Compaction** ➢ 95% of the ASTM: D698* ➢ 95% of the ASTM: D698* ➢ Same as "Below Floor Slabs" *Standard Proctor Density

- **Compaction Equipment and Placement of Engineered Fill**

Engineered fill should be compacted in maximum 12-inch loose lifts using heavy, self-propelled compaction equipment, or maximum 6-inch loose lifts using hand-operated compaction equipment. Smooth-faced, vibratory compaction equipment should be used for compaction of granular engineered fill. Clay engineered fill should be placed at a moisture content ranging from -4% to +2% of the optimum moisture content as determined by the Standard Proctor (ASTM: D698). The moisture content of granular engineered fill (sand) should be such to achieve the specified compaction. The moisture content of the clay soils should be maintained until placement of the footings and floor slabs. The engineered fill should be free of frost and should not be placed on frozen soils. Please refer to the attached "Precautions…During Cold Weather."

- **Geotechnical Engineer's Observations**

Soil types and strengths can sometimes vary around and in-between the borings. Some soils may not be as competent for support of the proposed building as those encountered in the borings. Therefore, we recommend that the soils exposed in the final footing and floor area excavations of the proposed building be observed in the field by a Geotechnical Engineer from Soil Technologies, Inc (STI). The Geotechnical Engineer will compare the exposed soils with the soils listed on the boring logs of this report to determine if they are the correct soil types and strengths. Once the type and strength of the soils exposed in the excavations are judged competent

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by STI's Geotechnical Engineer, the engineered fill, concrete footings, and floors can be placed as needed. STI's Geotechnical Engineer will provide a written report detailing the observations of the exposed soils in the footing and floor slab areas. **The general contractor or owner's representative should contact STI's Geotechnical Engineer to perform these field observations prior to the earthwork phase of the project.**

Note: This report and its recommendations are a two-step process. The first step is the implementation of the recommendations of this report during the design of the project. The second step is the implementation of these recommendations during construction. **The second step is critical to the success of the project, and it must include the field observations of the soils by STI's Geotechnical Engineer during the earthwork phase of the project.** It has been our experience that the lack of field observations by the Geotechnical Engineer during the earthwork phase of the project can result in oversight, in part or in whole, of the recommendations of the soils report. Therefore, the absence of our field observations of the soils during the earthwork phase, especially during the footing and floor area excavations, shall relieve us of the responsibility of the work performed during that phase of the project and its effect on related components.

2.3 Foundations

- **Allowable Soil Bearing Pressure**

In our opinion, the proposed structures can be supported on a shallow spread footing foundation system (column pads and/or strip footings). We recommend that the spread footings be designed using **an allowable soil bearing pressure of up to 2000 psf.**

The allowable soil bearing pressure listed above assumes that the site is prepared as recommended in section 2.2 Site Preparations and that the project is constructed as per the information and conditions listed in section 1.1 Project Information. **If the project information or conditions are changed, STI must be notified in writing for additional review.**

The allowable soil bearing pressure is based on our judgment of the soil conditions at the boring locations along with recommended compaction levels and our experience with similar soil conditions. The allowable soil bearing pressure is a net pressure and can be increased 30% for short-term loadings such as wind loads.

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- **Foundation Settlement**

The recommendations in this report should provide a theoretical safety factor of at least 3.0 against localized shear failure of the footings. Long term total settlements of the building footings are estimated to be less than 1 inch with estimated differential settlements less than ½ inch over a 30-foot length.

The above estimated settlements are based on the above recommended soil bearing pressure, the site being prepared as recommended in section 2.2 Site Preparations, and the project being constructed as per the information and conditions listed in section 1.1 Project Information: **the finished floor elevations will match that of the existing school and column loads will be a maximum of 125 kips (total dead and live loads) with continuous footing loads less than 4 kips/ft (total dead and live loads, etc.**

Pleases note that, the total and differential settlement of the footings (and floor slabs) could be significantly greater than the above estimates if improper construction practices are used. These practices may include but are not limited to: allowing snow or ice to be incorporated into the engineered fill soils, allowing the soils below the footings or floors to be saturated or freeze prior to or after their placement, inadequate compaction of engineered fill soils, supporting the footings or floor slabs on expansive soils such as fat clay (CH) or on soils that were inadvertently loosened during construction, etc.

- **Frost Depth**

To avoid frost related movement of heated structures during their entire life, the exterior footings should be placed at or below a frost depth as per city code, or a minimum 4½ feet below finished grade. Interior footings of heated buildings can be placed at shallower depths provided they are protected from frost during and after construction. To avoid frost related movement of unheated structures, canopies, etc., both the exterior and interior footings should be placed at least 5½ feet below the finished exterior grade or the floor slab, as appropriate.

- **Soil/Concrete Sliding Friction**

For horizontal loads, we recommend a soil-concrete friction factor of 0.35. The frictional factor should be applied only to the base (bottom) of the concrete foundation units and only the net downward vertical load should be used to determine the friction. An appropriate safety factor should be applied to the calculated lateral values.

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2.4 Lateral Earth Pressures

The below grade retaining walls should be designed to resist the lateral pressures of the retained backfill soils. For calculation of lateral earth pressures, we recommend the estimated ultimate pressure values listed in the tables below. An appropriate safety factor should be applied to the calculated design values. The pressure values are equivalent to that generated by a fluid. For active earth pressure, the retaining wall must rotate about the base. For passive pressures, the wall must move horizontally to mobilize resistance.

TABLE 3

Equivalent Fluid Pressures (Above Groundwater – Drained Condition)

Soil Type	Active Pressure (pcf)*	At Rest Pressure (pcf)*	Passive Pressure (pcf)*
Free Draining Sands (SP, SW,SP-SM, SW-SM)	35	55	330
Silty Sands & Clayey Sands (SM & SC)	47	68	350
Lean Clay & Sandy Lean Clay (CL)	42	65	300

*pcf = pounds per cubic foot

TABLE 4

Equivalent Fluid Pressures (Submerged Conditions)

Soil Type	Active Pressure (pcf)*	At Rest Pressure (pcf)*	Passive Pressure (pcf)*
Free Draining Sands (SP, SW, SP-SM, SW-SM)	78	87	190
Silty Sands and Clayey Sands (SM & SC)	82	92	220
Lean Clay & Sandy Lean Clay (CL)	85	95	180

*pcf = pounds per cubic foot

The above values are not applicable to dynamic loading conditions, loading from heavy compaction equipment, or the weight of an adjacent foundation. Additionally, the stated parameters for the submerged conditions should be used according to high ground water records which may be as high as 5 feet below grade during the spring thaw or high rainfall events.

The above values assume that the on-site soils adjacent to the retaining structure are in their undisturbed state or, if laterally over-excavated and backfilled, compacted to a density of 95% to 102% of the Standard Proctor density.

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The below grade structures should be waterproofed if possible. Drain tile systems should be incorporated in the design for below grade structures. The drain tile lines should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. Rigid PCV lines may be required to achieve positive drainage. Design considerations should be given to buoyancy factors in the case that dewatering is interrupted during the life of the structure. Unit weights of 110 pcf and 32 pcf can be used for compacted soil above and below the groundwater level, respectively.

Please note that if the pressures listed for the free-draining sands (SP), (SW), (SP-SM) or (SW-SM) are used in the design, we suggest that full time on-site observations and soil tests of the backfill be performed to ensure that only free-draining sands are actually used for all the backfill. If there is some doubt that the observations and testing is going to be performed, we suggest that the more conservative pressures listed for the (CL) be used in design.

If the walls are designed using the equivalent fluid pressures for a "free-draining sand" (SP, SW, SP-SM, SW-SM), the free-draining sand backfill soils around the perimeter of the structure and related components should extend outward at a 45^0 (or greater) "wedge" angle. Please see figure #5 below. The placement of the free-draining sand backfill should be verified in the field by the geotechnical engineer. Also, based on the design of the retaining wall(s), the structural engineer should specify on the structural plans the type of soil(s) that can be used for exterior backfill of the retaining walls (SP, SW, SP-SM, SW-SM, SM, SC, or CL) and if a 45^0 "wedge" is required.

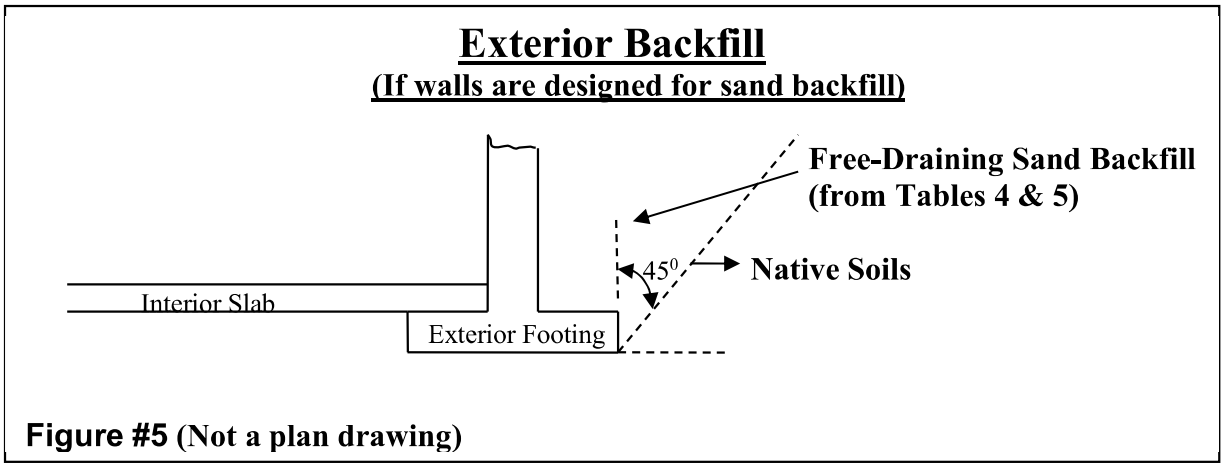


Figure #5 (Not a plan drawing)

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2.5 Exterior Backfill

- **Soil Type**

Assuming the absence of retaining or below grade basement or lower-level walls, the on-site or imported non-organic and non-expansive sand (SP, SW, SM, or SC) or the lean clay (CL) soils should be used for exterior backfill soils (fill soils placed outside the exterior foundation walls and adjacent areas). Utility trenches or other excavations leading to the building foundations or floor areas should also be backfilled with the on-site or imported non-organic and non-expansive sand or clay soils. However, if sand backfill is used within 10 feet of the proposed structure, an 18-inch compacted clay cap or an asphalt or concrete pavement should be placed at the surface of the backfill to help minimize surface water from reaching the foundation soils. (Please refer to Figure #5 on page 15.)

Organic soils (usually black colored) should not be used for exterior backfill, except for cover material. Also, soils that can expand, such as fat clay (CH), should not be used for backfill against retaining type structures or below slabs, sidewalks, driveways, etc.

- **Compaction and Placement of Exterior Backfill**

Exterior backfill soils placed along foundation walls and in adjacent areas such as beneath lawns, sidewalks, traffic areas, or in utility line trenches, should be compacted to the following minimum percent densities as listed in Table 5 below. Note: Exterior backfill soils placed within the "influence zone" below the footings should be compacted to the minimum densities listed for footings on page 9.

TABLE 5

Compaction of Exterior Backfill	Light Traffic Areas (autos, driveways, sidewalks, etc. - below granular base):	95% of the ASTM: D698*
	Heavy Truck Traffic Areas (below granular base):	97% of the ASTM: D698*
	Utility lines and other backfill within 10 feet of the proposed structure(s) except in traffic areas use above %. .	95% of the ASTM: D698*
	Non-Traffic Areas (lawns, landscaping areas, etc.) greater than 10 feet of the proposed structure(s)	92% of the ASTM: D698*

*Standard Proctor Density

Exterior backfill soils should be compacted in maximum 12-inch loose lifts using heavy, self-propelled compaction equipment, or maximum 6-inch loose lifts using hand-operated compaction equipment. Clay exterior backfill soils should be placed at a moisture content ranging from -4% to +2% of the optimum moisture content as determined by the Standard Proctor. The moisture

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content of granular exterior backfill soils (sand) should be such to achieve the specified compaction. Smooth-faced, vibratory compaction equipment should be used for compaction of granular backfill soils. The backfill material should be free of frost and should not be placed on frozen soils. Please refer to the "Precautions…During Cold Weather" attached to this report.

2. 6 Site Drainage

- **Site Grading**

Proper drainage should be maintained during and after construction. General site grading should not allow water to pond in the building areas or in the excavations. Any ponded water should be removed immediately. Finished grades around the perimeter of the structure should be sloped away from the structure with a minimum slope of 1 inch per foot for at least 10 feet beyond the excavation lines. (Please refer to Figure #6 below.) The slope can be reduced to ¼ inch per foot in areas that are completely surfaced and properly sealed with asphalt or concrete. The slope and proper drainage should be maintained throughout the life of the structure.

Exterior Backfill and Site Drainage

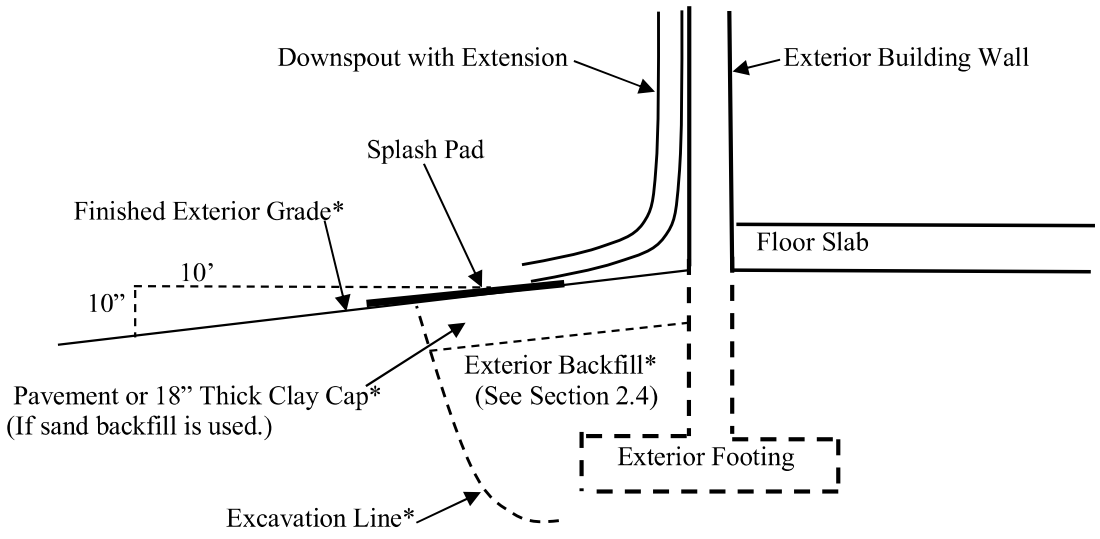


Figure #6 (not a plan drawing) *Specific specifications listed in this report.

- **Roof Runoff**

Roof runoff water should be controlled by a system of downspouts and gutters with proper extensions to remove the runoff water away from the structure. The gutters and downspouts, as

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well as splash pads and extensions, should be maintained so that leakage does not occur adjacent to the structure. (Please refer to Figure #6 above.)

2.7 Pavement Recommendations

- **Subcutting**

Site preparations for the proposed parking lot. driveway, and playground areas should consist of the excavation (subcutting) of the existing pea rock, gravel, and clay "fill" soils to a depth that would provide for the placement of the recommended pavement sections listed below. At a minimum, the top 6 inches of the existing surface soils (typically dark brown or black colored) should be excavated before placement of any new base or subgrade materials. The purpose of the excavation of the top 6 inches is to remove the pea rock and the majority of the higher organic, contaminated, or loose soils that may exist at the surface of the parking lot site. Final excavation depths should be determined in the field by a STI's Geotechnical Engineer to verify that the necessary soils have been removed.

- **Scarify and Recompact**

Following the subcutting operations, we recommend scarifying the exposed subgrade soils to a depth of at least 12 inches and recompacting them to the following densities:

- Light-Duty Pavement: **Minimum of 95%** of Standard Proctor density (ASTM: D698).
- Heavy-Duty Pavement: **Minimum of 97%** of Standard Proctor density (ASTM: D698).

Note: Utility trench backfill soils below the 12-inch scarified section should be compacted to a minimum of 95% (ASTM: D698) for both the light-duty and heavy-duty pavements.

During the recompaction of the scarified subgrade soils, adequate stability of the subgrade soils must exist prior to the placement of additional subgrade soils and/or the pavement section. To help achieve stability, the moisture content of the subgrade soils at the time of scarifying/recompaction should be slightly below the optimum moisture content (-4% to -1%) as determined by the Standard Proctor.

- **Proof-Roll**

In addition to the scarifying/recompaction process, the final surface of the subgrade should be **proof-rolled** using heavy wheel load equipment such as a loaded truck or pay-loader. The proof-roll should then be observed by STI's on-site Geotechnical Engineer. Deflections or rutting of the subgrade soils by 1 inch or more should be reworked and moisture adjusted so that a deflection

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of less than 1 inch is achieved. If soft areas develop during scarifying/recompaction or proof-rolling and cannot be remedied, they should be removed and replaced with a granular fill (sand/gravel) or, alternatively, a non-organic lean clay fill having a liquid limit of 45 or less and a plasticity index between 14 and 28. The fill soil should be compacted to a density of at least 95% (Light-Duty Pavement) or at least 97% (Heavy-Duty Pavement) and at a moisture so that a deflection of less than 1 inch is achieved. The engineer should document the proof-roll procedure and acceptance.

- **Geotextile Fabric**

It is our opinion that at least a light to medium weight geotextile fabric such as a Linq GTF-200, Marafi 170N, or functionally equivalent, should be a consideration in the design of the pavement section. The purpose of a geotextile fabric is to help limit the clay and silt particles of the subgrade from migrating up into the base materials. This migration of the clay and silt particles often weakens the base materials and shortens the design life of the pavement section. The fabric should be placed below the granular base materials. Although not required to provide a typical pavement life for this site, it is our opinion that the geotextile fabric will extend the life of the pavement with fewer repairs. Please note that the "piping ratio" and "size ratio" of the geotextile fabric should be checked to verify that the type of fabric is appropriate for the particle sizes of the subgrade soils present at the site and the base material planned to be used.

- **Additional Subgrade Fill**

If additional subgrade fill is required to meet design grade elevations of the proposed pavement areas, we recommend a suitable subgrade material be used. Ideally, a granular (sand or gravel) material should be used. Alternatively, non-organic and non-expansive clay having a liquid limit of 45 or less and a plasticity index between 14 and 28 could be used. The subgrade fill soils should be placed in maximum 8-inch loose lifts and compacted to the following:

- Light Duty Pavement: **Minimum of 95%** of Standard Proctor density (ASTM: D698).
- Heavy Duty Pavement: **Minimum of 97%** of Standard Proctor density (ASTM: D698).

To help achieve adequate stability, the moisture content of the subgrade fill at the time of compaction should be below the optimum moisture content (-4% to -1%) as determined by the Standard Proctor.

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- **Base Material Specifications and Compaction**

We recommend the aggregate base course and granular subbase materials along with the bituminous asphalt used for the pavement sections meet the specifications outlined in the South Dakota Department of Transportation Standard Specifications. The aggregate base course and granular subbase material should be compacted to the following:

- Light Duty Pavement: **Minimum of 98%** of Standard Proctor density (ASTM: D698).
- Heavy Duty Pavement: **Minimum of 100%** of Standard Proctor density (ASTM: D698).

➢ **Pavement Sections**

We recommend the placement of the following minimum pavement sections listed in Table 6 below, as appropriate. The designs on based on the above recommended site preparations (excavation, scarify and recompact, etc.). Divergence from these site preparations may render the pavement sections inadequate.

The pavement section designs listed are also based on an estimated CBR value of about 2.5 % or higher, which in turn is based on the site preparations of the pavement area. Also, the pavement section designs are based on a 25-year pavement life and an estimated traffic count of up to 50 vehicles/day. The light-duty pavement assumes that about 7% of the traffic consist of trucks having 3 axles or more. The heavy-duty pavement assumes that about 35% of the traffic consist of trucks having 3 axles or more. Finally, the pavement section designs assume legal load limits during all 4 seasons of the year.

TABLE 6

Pavement Description	Pavement Surfacing	Aggregate Base Course	Granular Subbase	Geotextile Fabric
Light Duty Pavement *(mostly cars, 7% light to medium trucks, light snow removal equipment)*			Optional+	Consider a light to medium weight geotextile fabric such as a Marafi 170N, Linq GTF-200 or functionally equivalent. *
Asphalt:	4”	8"		
Concrete:	5”	6"		
Heavy Duty Pavement *(heavy trucks, heavy snow removal equipment, trash bin areas)*			Optional+	
Asphalt:	5"	13"		
Concrete:	6"	11"		

+Not required but can be used to reach Aggregate Base Course grade elevation.

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- **Concrete Pavement**

The concrete paving products should be composed of a quality mix. The mix should have a proven success record, or a mix design should be established for proper proportions of aggregate, cement, water, and any admixtures. The concrete should be handled, placed, and cured according to current **ACI Guidelines and Specifications for Exterior Concrete**. The concrete should have a minimum compressive strength of 4000 psi, be placed with a maximum slump of 3 inches, and should have air entrainment between 5% and 7%.

Relative to saw joints, a maximum width in the longitudinal and transverse directions should be provided as per ACI guidelines. All saw joints should be installed as soon as the surface is sufficiently hard to support equipment and within a maximum of 24 hours of casting. All joints should be adequately sealed with proper joint sealer.

- **Subgrade and Surface Drainage**

We recommend that extra care be taken in the design and construction process to help ensure that adequate surface and subgrade drainage is maintained throughout the paved areas. The pavement surface should be uniformly sloped to facilitate its drainage. In addition, the subgrade surface should be uniformly sloped to facilitate drainage of the base material within the pavement system and to avoid any ponding of water beneath the pavement. Edge drains, center drain tile, and/or center storm sewer drains should be used where possible. The purpose of the drainage is to minimize saturation of the subgrade soils and to minimize potential distress due to moisture and frost related movement of the underlying soils. Timely maintenance such as crack filling, seal coats, and localized patching should be routinely performed in all pavement areas.

- **Frost and Moisture Related Movement**

The clay soils encountered at the site likely have a moderate susceptibility of frost related movement and therefore, some frost related distress (cracking) of the asphalt and concrete should be expected. Even if the asphalt or concrete pavement is properly placed and adequately compacted on aggregate base materials and stable subgrade soils, pavements will still experience cracking after the first year or two. The potential of distress can be minimized by 1) adding a significant depth of relatively clean granular subbase material below the aggregate base course, 2) compacting the subgrade soils to greater depths, and 3) increasing the percent compaction of the subgrade soils. Also, we recommend that a regularly scheduled maintenance program consisting of patching of cracks and local distressed areas be performed. Seal coating of the asphalt pavement surface after 3 to 5 years typically prolongs the pavement life.

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3.0 CONSTRUCTION AND DESIGN CONSIDERATIONS

3.1 Site Excavation

- **Soil Disturbance & Moisture Changes**

The soils encountered at the site can be sensitive to disturbance and may experience strength loss under the influence of construction traffic and/or additional moisture. Construction traffic in areas where these soils are used for structural support should be limited. If self-propelled compaction equipment is used, extra care should be taken so as not to disturb (weaken) the native soils due to excess weight and/or vibration of the equipment. If the soil used for structural or wheel traffic support becomes frozen, desiccated, saturated, or is disturbed, the affected soil should be removed; or if the disturbance is shallow, recompated in-place prior to placement of additional fill or structural units. Also, the site preparations should include complete removal of all remnants of previously existing structures, structural units, utilities, tree roots, etc. Excavations to remove these items, or intrusions (accidental, deliberate, or otherwise) should be backfilled with engineered fill and compacted to the specified density listed on page 9.

The excavations should be left open a minimal amount of time to prevent strength loss of these soils by ponding of water or changes in their in-situ moisture content. In addition, surface drainage away from the excavations should be provided during construction.

- **Dewatering**

We do not anticipate that the footing or floor excavations will extend below the groundwater level, and thus, dewatering techniques for proper placement of engineered fill and/or the footings/floor slab system are not anticipated but should not be ruled out. Please refer to the groundwater measurements listed at the bottom of the attached boring logs.

If groundwater is encountered, the excavations and dewatering must be such as to provide for physical access and observations of the soils at the bottom of the excavations, and for proper compaction of the engineered fill soils at the bottom of excavations. Dewatering will also help limit the potential softening or loosening of the native clay soils prior to placement of the engineered fill and the footings.

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- **Seismic Category**

Based on IBC 2021, the subsurface conditions encountered at the site, and our experience with other general geologic conditions for this area, it is our opinion that Site Class D should be used to determine site coefficients and seismic design category.

- **Expansion Joint and Structural Movement Considerations**

We recommend the placement of an expansion joint between the existing structure and the proposed addition(s) or its corridors to accommodate any differential movement that may occur. Underground piping between the structures should be designed with flexible couplings, and the utility knockouts in foundation walls should be oversized so deflections in alignment do not result in breakage or distress

- **Existing Structure**

If the foundations for the proposed building are placed next to the existing structure, care should be taken not to undermine the foundations of the existing structure. Also, to prevent additional loading on the existing foundations, the new foundations should rest at or below the depth of the existing foundations. If the new foundations rest within a 45^0 envelope below the existing foundations, the new foundations may need to be designed for increased loading caused by the overlying pressures of the existing footings. Please contact us if this situation develops in the design.

- **Exterior Movement**

Exterior architectural features, slabs, and utilities can experience moisture or frost related movement which can result in distress. The risk of this potential movement and subsequent distress can be reduced (but not necessarily eliminated) by:

1. The use of control joints.
2. The use of self-adjusting utility connections.
3. Allowing for movement for exterior features attached to structural elements.
4. The use of significant depths of granular fill material beneath slabs-on-grade.
5. Proper drainage away from exterior slabs-on-grade.
6. Placement of rigid insulation sheeting under at least 10 inches of free draining granular fill.

- **OSHA**

Excavations must comply with the requirements of local, state, federal and other prescribed safety regulations, e.g., OSHA 29 CFR Part 1926, Subpart P, "Excavations." Reference to these requirements should be included in the project specifications.

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3.2 Excavation Observation and Testing

The recommendations contained in this report are based on the subsurface conditions found at the boring locations. It is possible that there are soil conditions on the site that were not represented by the borings. Consequently, on-site observation by a qualified Geotechnical Engineer during construction is considered integral to the successful implementation of the recommendations.

We recommend that a Geotechnical Engineer from Soil Technologies, Inc. be on-site during the excavation operations. The engineer will judge if the soils exposed at the bottom and along the sidewalls of the excavations are adequate for support of the floor slab and for the foundations designed with the allowable soil bearing pressure recommended in this report. The Geotechnical Engineer should also be on-site immediately prior to placement of the sand cushion, reinforcing steel, and/or concrete of floor slab to verify that the floor area soils are not frozen, rutted, desiccated, saturated and/or otherwise disturbed. In addition, we recommend that density testing be performed within the sequence of the engineered fill.

3.3 Concrete

The concrete used for the project should be composed of a quality mix that has proven success, or a mix design should be established for proper proportions of aggregate, cement, water, and any admixtures. The concrete should be handled, placed, and cured according to the recommendations in the current **ACI** manual. Improper mix designs, placement methods, saw joints, curing methods, temperatures, etc. could result in the concrete experiencing excessive shrinkage, cracking, curling, pop-outs, and other distress. These items should be monitored by a qualified engineer during construction. Also, floor covering should not be placed on the slab until it is nearly fully cured. Typically, flooring manufactures require 3 to 4 weeks or more of curing time at room temperature (60^{o} F or more) prior to placement of flooring.

4.0 GENERAL EXPLORATION INFORMATION

4.1 Scope of Exploration

We have conducted a soil exploration program for the proposed project. The scope of our services under this exploration is limited to the following:

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1. To perform soil borings to explore the subsurface soil and groundwater conditions.
2. To perform nominal laboratory tests to aid in judging the soil properties.
3. To provide a geotechnical engineering report including the results of the field and laboratory tests as well as geotechnical engineering opinions and recommendations that are relative to the project.

Twelve standard penetration test borings were performed at the site on December 1, 2, and 5, 2022. The borings were performed at the locations shown on the attached sketch. Some settlement of the soils used to fill the open bore holes should be anticipated and closure of the holes is the responsibility of the client or property owner.

4.2 Site Surface Conditions

The site of the proposed construction is located on the east side of the existing Willow Lake school building, east of the intersection of 4th Street and Garfield Street in Willow Lake, SD. The site is bordered on the east by Monroe Street. The site surface at the time of our soil borings consisted of gravel, pea rock, and asphalt. The overall general topography of the site is relatively level. The ground elevations at the boring locations were referenced to the survey benchmark (BM) shown on the attached sketch. The elevations are listed at the top of the attached boring logs.

4.3 Site Subsurface Conditions

The subsurface conditions encountered at each boring location are illustrated on logs attached to this report. The logs also indicate the possible geologic origin of the materials encountered. A description of the general soil profile is also provided in section **2.1 Discussion.** We wish to point out that the subsurface conditions at other times and locations at this site may differ from those found at our boring locations. If different subsurface conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

4.4 Water Levels

Observations for subsurface groundwater were made at the boring locations during our field operations. Groundwater was encountered at the boring locations during our sampling operations. Specific information relative to the groundwater observations is shown at the bottom of the boring logs.

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The absence or level of groundwater in the borings may not represent the actual static groundwater levels. In order to accurately determine the static groundwater level, observations over an extended period are usually required. Such periods of observation are normally not available in a typical soil exploration program. Seasonal and annual fluctuations of the groundwater levels should be expected to occur. It is possible that the subsurface groundwater levels during or after construction could be significantly different than at the time the borings were performed.

4.5 Laboratory Test Program

Soil samples were selected for laboratory tests to determine the engineering and index properties. Where applicable, the tests were performed in accordance with the American Society for Testing and Materials (ASTM) procedures. The test results are shown on the boring logs opposite the samples upon which the tests were made or, they are attached.

5.0 LIMITATIONS, REVIEW, USE, AND PURPOSE OF REPORT

- **Limitations**

The data obtained from the sampling and testing of the soils encountered at the boring locations are the basis of the recommendations submitted in this report. However, variations can occur between these borings and between the samples. Thus, no exploration program can totally reveal the exact subsurface conditions for the entire site. If the subsurface conditions encountered at the time of construction differ from those represented by our borings, it is necessary to contact us so that our opinions and recommendations can be reviewed. Differing subsurface conditions may result in altering our recommendations which may affect construction costs. It is suggested that a contingency be provided for this purpose.

- **Review of Report**

This report is founded on the information and conditions listed in this report for design of the proposed structure(s). We recommend that we be retained to briefly review the geotechnical aspects of the final design and specifications to determine whether any changes in design may have had an effect on the validity of the recommendations contained in this report, and whether our recommendations have been correctly communicated so that their intent has been implemented in the design and specifications. Divergence from our recommendations by the design, specifications, or field applications shall relieve us of the responsibility of that portion of the project and its effect on related components unless our written agreement with such divergence

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has been obtained. Also, we recommend that this report is provided to the owner(s) along with the architect(s), engineer(s,) contractor(s), etc. chosen for design and construction of the project.

- **Use of Report**

This report is intended for the Client's sole use and benefit and solely for the Client's use in the design and construction of the proposed project described herein and in preparation of construction documents. The data, analysis, and recommendations in this report may not be appropriate for extensions of the proposed project or for other projects or purposes. Thus, this report shall not be used or relied on by persons or entities for extensions of the proposed project or for other projects or purposes. Parties contemplating extensions of the proposed project or for other projects or purposes must contact us for additional review. In the absence of our written review and approval, we make no representation and assume no responsibility for extensions of the proposed project or for other projects or purposes. Also, this report is not a bidding document and is only an aid in the design and construction of the proposed project. Contractors and others involved in the project must draw their own conclusions regarding the site conditions and construction methods.

- **Purpose of Report**

The purpose of this report is to present the results of our field and laboratory tests as well as our geotechnical engineering review and recommendations for the project. Our work is intended for geotechnical purposes only and not to verify the presence or extent of any contamination at the site. If environmental information is desired, an environmental assessment should be conducted.

6.0 STANDARD OF CARE

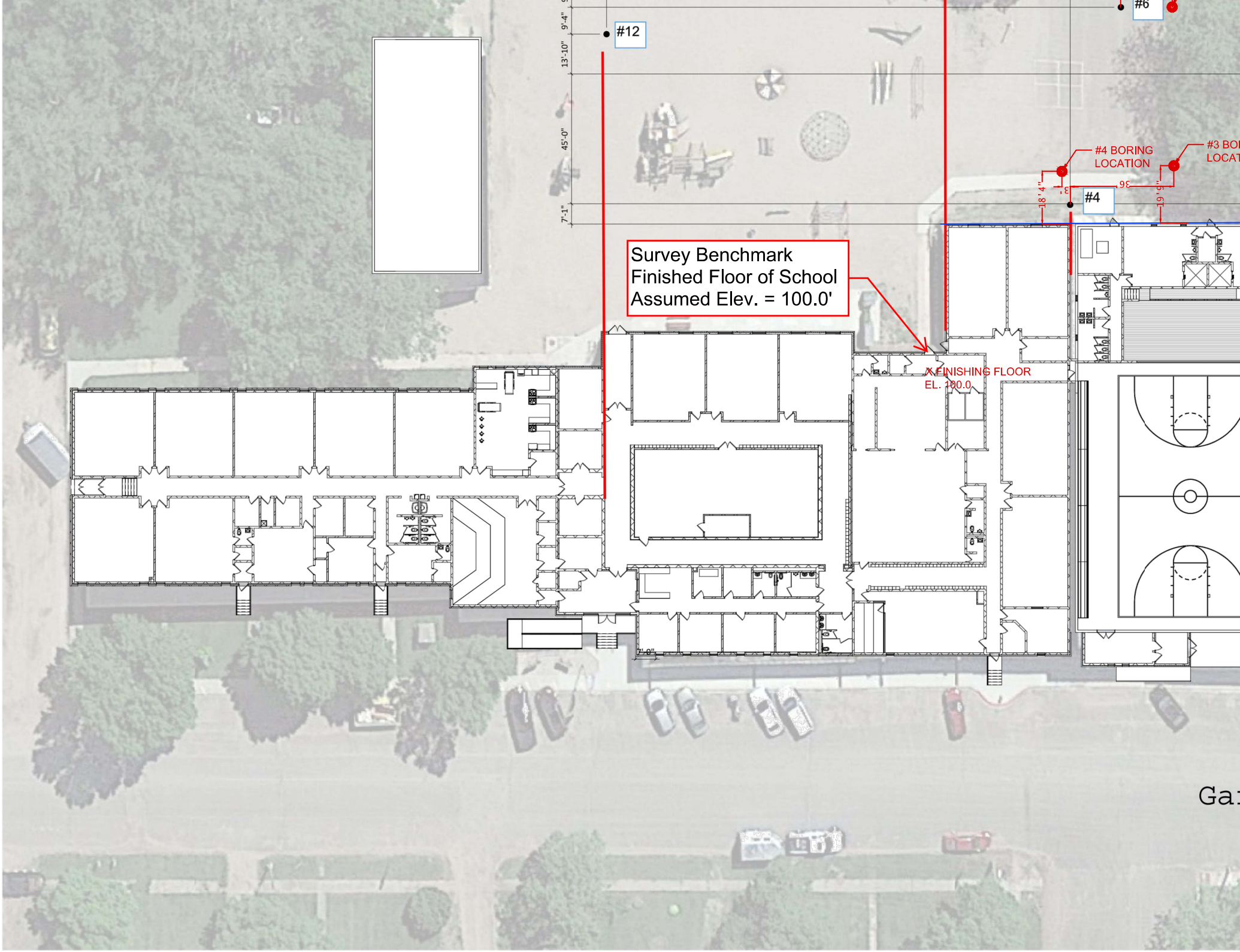
The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no other representation, guarantee, or warranty, either expressed or implied, is made.

This report was prepared by:



Kim E. Stoecker, PE
President

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#12
#6
#4
#4 BORING LOCATION
#3 BO
LOCAT
9'-4"
13'-10"
45'-0"
7'-1"
18' 4"
19' 9"
Survey Benchmark
Finished Floor of School
Assumed Elev. = 100.0'
X FINISHING FLOOR
EL. 100.0
7'-0"

BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 1

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 99.5

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, mostly Organic Lean Clay, black, moist, 3" of Gravel at the surface	FILL		6	1	SPT							
1.5	98.0	**Sandy Lean Clay**, gray and brown, moist, stiff (CL)	MIXED ALLUVIUM		10	2	SPT	19						49
					12	3	SPT							
6	93.5	**Silty Sand**, fine to coarse grained, a little Gravel, brown, wet, medium dense (SM)			19	4	SPT							
9.5	90.0	**Fat Clay with Sand**, light gray, moist, firm (CH)	FINE ALLUVIUM		8	5	SPT							
11	88.5	**Fat Clay with Sand**, brown, moist, a layer of Sand at 15', stiff (CH)			14	6	SPT							
15.5	84.0				15	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 1.5' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/05/2022 *at*

Boring Completed: 12/05/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: TB **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 2

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.2

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, mostly Organic Lean Clay, black, moist, 3" of Gravel at the surface	FILL		5	1	SPT							
3	97.2				7	2	SPT							
4	96.2	**Lean Clay**, light brown, moist (CL)	FINE ALLUVIUM											
		Clayey Sand, fine grained, gray and brown, moist, loose (SC)	MIXED ALLUVIUM		10	3	SPT							
6	94.2	**Lean Clay with Sand**, a trace of Gravel, brown to 11' then brown mottled, moist, firm to stiff to very stiff to stiff (CL)	TILL		7	4	SPT							
					9	5	SPT							
					17	6	SPT							
15.5	84.7				14	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 3.0' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/05/2022 *at*

Boring Completed: 12/05/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: TB **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 3

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.3

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LAB Moisture (%)	LAB Dry Density (pcf)	LAB Pocket Pen (tsf)	LAB Qu (psf)	LAB Liquid Limit	LAB Plastic Limit	LAB 200 Sieve (%)
1	99.3	**Fill**, Organic Lean Clay, black, moist	FILL		5	1	SPT	17	96	4.5+				
		Fill, Lean Clay, brown and black, moist												
					7	2	SPT							
3.5	96.8	**Lean Clay**, brown mottled and gray, moist, firm (CL)	FINE ALLUVIUM		6	3	SPT	28	95	0.8				
6.5	93.8	**Sandy Lean Clay**, a little Gravel, brown mottled, moist, firm to stiff (CL)	TILL	▼	8	4	SPT							
10.5	89.8	**Lean Clay**, brown, moist (CL/CH)	FINE ALLUVIUM		11	5	SPT							
					16	6	SPT	23	103	1.9				
13.5	86.8	**Sandy Lean Clay**, a little Gravel, brown, moist, very stiff (CL)	TILL											
15.5	84.8				16	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 3.5' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
12/05/2022		after 4-5 hours			8.5'

Boring Started: 12/05/2022 *at*

Boring Completed: 12/05/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: TB **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 4

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.3

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, mostly Organic Sandy Lean Clay, black, moist, a layer of Asphalt at the surface	FILL		7	1	SPT							
2	98.3	**Lean Clay**, brown, moist, firm (CL)	FINE ALLUVIUM		6	2	SPT							
4	96.3	**Sandy Lean Clay**, a trace of Gravel, brown mottled and gray, moist, firm to soft (CL)	MIXED ALLUVIUM		7	3	SPT	25	100	0.9		45	18	
					4	4	SPT	25	95	0.9				
8.5	91.8	**Sandy Lean Clay**, a little Gravel, grayish brown, moist, stiff (CL)	TILL		13	5	SPT							
11	89.3	**Sandy Lean Clay**, a little Gravel, brown and dark gray, moist, stiff to very stiff (CL/CH)			15	6	SPT							
15.5	84.8	**END OF BORING**			16	7	SPT							

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 2.0' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/01/2022 *at*

Boring Completed: 12/01/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/ **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 5

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.7

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Organic Lean Clay, black to dark brown, moist (CL-OL)	TOPSOIL		7	1	SPT							
2.5	98.2	**Lean Clay**, brown, moist, firm (CL)	FINE ALLUVIUM		6	2	SPT							
5	95.7	**Lean Clay**, brown mottled, moist, firm (CL)			7	3	SPT							
6.5	94.2	**Sandy Lean Clay**, brown mottled, moist, a 3" layer of gray Sand at 6.5', firm (CL)	TILL		8	4	SPT							
10	90.7	**Fat Clay with Sand**, light brown, moist, firm (CH)	FINE ALLUVIUM		8	5	SPT							
11.5	89.2	**Fat Clay**, a little Gravel, grayish brown, moist, very stiff to stiff (CH)	TILL		19	6	SPT							
15.5	85.2	**END OF BORING**			13	7	SPT							

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 2.5' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/05/2022 *at*

Boring Completed: 12/05/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: TB **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 6

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.8

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, a mixture of Sand, Gravel, and Concrete, brown and gray, dry	FILL		3	1	SPT							
					15	2	SPT							
4.5	96.3	**Lean Clay**, brown mottled and gray, moist, stiff (CL)	FINE ALLUVIUM		10	3	SPT	21	101	3.2				
					11	4	SPT							
					9	5	SPT							
11	89.8	**Sandy Lean Clay**, a little Gravel, brown, moist with waterbearing Sand layers, stiff (CL)	TILL	▼	12	6	SPT							
15.5	85.3				11	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 4.5' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
12/2/2022					14'

Boring Started: 12/02/2022 *at*

Boring Completed: 12/02/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/JW **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 7

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* **SURFACE ELEVATION =** 100.9

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Organic Lean Clay, dark brown, dry to moist	POSSIBLE FILL		10	1	SPT							
2.5	98.4													
		Lean Clay, light brown, dry to moist, firm (CL)	FINE ALLUVIUM		7	2	SPT							
4	96.9													
		Lean Clay, brown mottled, moist, firm (CL)	TILL		6	3	SPT							
6	94.9													
		Sandy Lean Clay, a little Gravel, brown mottled to 11' then brown, moist, firm to stiff to very stiff (CL)			6	4	SPT	24	102	1.1				
					11	5	SPT							
					12	6	SPT							
15.5	85.4				17	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 2.5' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/05/2022 *at*

Boring Completed: 12/05/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: TB **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 8

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.9

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Organic Lean Clay, dark brown, moist (CL/OL)	TOPSOIL		14	1	SPT							
2	98.9	**Lean Clay with Sand**, brown, moist, firm (CL)	FINE ALLUVIUM		8	2	SPT							
4	96.9	**Lean Clay**, brown mottled and gray, moist, stiff to firm (CL)			9	3	SPT	24	98	1.5		43	18	
					8	4	SPT							
8.5	92.4	**Sandy Lean Clay**, a little Gravel, brown mottled to brown, moist, stiff (CL)	TILL		10	5	SPT							
					12	6	SPT							
13.5	87.4	**Sandy Lean Clay**, light brown/olive, moist, stiff (CL)												
15.5	85.4				12	7	SPT							
		END OF BORING												

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 2.0' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/01/2022 *at*

Boring Completed: 12/01/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/JW4/BW **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 9

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.8

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, Organic Lean Clay**,** brown and dark brown, moist	FILL		9	1	SPT							
2	98.8	**Lean Clay**, brown, dry to moist, stiff (CL)	FINE ALLUVIUM		10	2	SPT							
4	96.8	**Lean Clay**, brown mottled and gray, moist, stiff (CL)			12	3	SPT							
6	94.8	**Sandy Lean Clay**, a little Gravel, brown, moist, stiff (CL)	TILL		9	4	SPT							
9	91.8	**Sandy Lean Clay**, a little Gravel, brown mottled and gray, moist, stiff (CL)			13	5	SPT							
11.5	89.3	**Sandy Lean Clay**, a little Gravel, brown, moist, stiff to very stiff (CL)			15	6	SPT							
15.5	85.3	**END OF BORING**			16	7	SPT							

For Footings and Floor Areas: Excavate the "Topsoil" to expose the native clay "Alluvium" soils at a depth of at least 2.0' below the existing grade. Final excavation depths shall be determined by STI's on-site Geotechnical Engineer.

WATER LEVEL MEASUREMENTS ▼

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/01/2022 *at*

Boring Completed: 12/01/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 16'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/JW4/BW **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 10

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.5

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, mostly Lean Clay, brown, moist, Pea Rock at the surface	FILL		8	1	SPT							
1.5	99.0	**Fill**, Sandy Lean Clay**,** a little Gravel, dark brown, moist												
					8	2	SPT							
3.5	97.0	**Lean Clay**, brown mottled and gray, moist, stiff (CL)	FINE ALLUVIUM											
5	95.5				9	3	SPT							
		END OF BORING												

WATER LEVEL MEASUREMENTS

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/01/2022 *at*

Boring Completed: 12/01/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 5'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/JW4/BW **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 11

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* **SURFACE ELEVATION =** 100.6

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, Lean Clay, black and brown, Pea Rock at the surface	FILL		6	1	SPT							
1.5	99.1	**Fill**, Sandy Lean Clay, a little Gravel, dark brown and black, moist			6	2	SPT							
3.5	97.1	**Lean Clay**, brown mottled and gray, moist, firm (CL)	FINE ALLUVIUM											
5	95.6	**END OF BORING**			8	3	SPT							

WATER LEVEL MEASUREMENTS

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: 12/2/2022 *at*

Boring Completed: 12/2/2022 *at*

Drilling Method: *to*

Drilling Method: 4" FA 0 *to* 5'

Jet with Drilling Mud: *to*

Hammer Type: Auto Hammer (140 lb)

Crew Chief: RR/JW4 **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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BORING LOG

STI JOB #: 22-1782 **Project:** School Addition **BORING #:** 12

Location: Willow Lake, SD Sheet 1 of 1

Latitude (North)= *Longitude (West)=* ***SURFACE ELEVATION =*** 100.1

Depth (ft.)	Elev. (ft.)	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	Water Level	N. Value	SAMPLE Sample No.	SAMPLE Sample Type	LABORATORY TESTS Moisture (%)	Dry Density (pcf)	Pocket Pen (tsf)	Qu (psf)	Liquid Limit	Plastic Limit	200 Sieve (%)
		Fill, Lean Clay, a little Gravel, black and brown, moist. Pea rock at the surface.	FILL			1	FA							
3	97.1	**Sandy Lean Clay**, a little Gravel, brown mottled, moist, stiff (CL)	TILL		7	2	SPT							
5	95.1	**END OF BORING**			12	3	SPT							

WATER LEVEL MEASUREMENTS

DATE:	TIME:	SAMPLED TO:	CAVE IN:	CASING:	DEPTH:
					NONE

Boring Started: at

Boring Completed: at

Drilling Method: to

Drilling Method: 4" FA 0 to 5'

Jet with Drilling Mud: to

Hammer Type: Auto Hammer (140 lb)

Crew Chief: **Logged By:**

Backfill Method:

SOIL TECHNOLOGIES, INC
28822 124TH ST., MOBRIDGE, SD
TELEPHONE: (605) 762-3406

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FIELD EXPLORATION PROCEDURES

Soil Sampling

Soil sampling was performed in accordance with ASTM: D1586. Using this procedure, a 2" O.D. split barrel sampler is driven into the soil by a 140-lb. weight (hammer) falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or N value. The N value is an index of the relative density of the cohesionless (sandy) soils and the consistency of cohesive (clayey) soils. Thin walled tube samples, if taken, were obtained according the ASTM: D1587 where indicated by the appropriate symbol on the boring logs. Rock core samples, if taken, were obtained by rotary drilling in accordance with ASTM: D2113. Power auger borings, if performed, were done in general accordance with ASTM: D1452.

Soil Classification

As the samples were obtained in the field, they were visually and manually classified by the crew chief in general accordance with ASTM: D2487. Representative portions of the samples were then returned to the laboratory for further examination and for verification of the field classification. Logs of the borings (test holes) indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the bore holes are attached. Charts illustrating the descriptive terminology and the symbols used on the boring logs are also attached.

LOG OF BORING– "DESCRIPTIONS"

Depth - Depth below the existing grade at the location and time the sampling was performed.
Description of Material – Soil type based on visual and manual methods and/or laboratory tests (see "Soil Classification" above).
Surface Elevation – Elevation of the existing grade at the boring location and at the time the boring was performed.
Geologic Origin - A description of the most likely source of the soil deposit.
WL - The highest groundwater measurement at the time and location the sampling was performed marked by the symbol ▼. (Also see "Water Level Measurements" on boring log).
N VALUE - The number of hammer blows required to drive the sampler 12" (see "Soil Sampling" above).
SAMPLE NO. – The sample number, i.e. 1, 2, 3….
SAMPLE TYPE – The type of equipment used to sample the soil (SPT = Standard Penetration Test, SB = Split Barrel Sampler, FA = Flight Auger, HSA = Hollow Stem Auger).
QU – Laboratory test. (See the attached "Symbols and Terminology.")
Drilling Method – The type of equipment used in to advance (drill) the boring.

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SYMBOLS AND TERMINOLOGY

DRILLLING AND SAMPLING SYMBOLS

SYMBOL	DEFINITION
N	Standard Penetration – blows per foot
WOH	Weight of Hammer
B	Bag Sample
DM	Drilling Mud
FA	Flight Auger
HA	Hand Auger
HSA	Hollow Stem Auger
JW	Jetting Water
NSR	No Sample Recovered
_Q	BQ, NQ or PQ Wireline System
SB	Split Barrel Sampler
SPT	Standard Penetration Test
3TW	3" Thin Walled Tube Sample
CS	California Sampler
▼	Water Level Symbol

TEST SYBMOLS

SYMBOL	DEFINITION
W	Water Content by weight (ASTM:D2216)
D	Dry Density - pounds per cubic foot
LL	Liquid Limit (ASTM: D4318)
PL	Plastic Limit (ASTM: D438)
Qu	Unconfined Compressive Strength – pounds per square foot (ASTM: D2166)
Pq	Penetrometer Reading – tons/square ft.
Su	Undrained Shear Strength
R	Laboratory Resistivity
G	Specific Gravity – ASTM: D854
OC	Organic Content
K	Coefficient of Permeability
VS	Field Vane Shear (ASTM: D2573)
RQD	Rock Quality Designation - percent
CR	Core Recovery (percent)

WATER LEVELS

Water levels shown on the test hole (boring) logs are the water levels measured in the test holes at the time and under the conditions indicated. In sand soil, the indicated levels may be considered fairly reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for the test hole, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the water levels shown on the test hole logs for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

RELATIVE DENSITY	"N" VALUE
very loose	0-4
loose	5-10
medium dense	11-24
dense	25-50
very dense	>50

CONSISTENCY	"N" VALUE
very soft	0-1
soft	2-4
firm	5-8
stiff	9-15
very stiff	16-30
hard	31-60
very hard	>60

"N" is the Standard Penetration, in blows per foot, of a 140 pound hammer falling 30 inches onto a 2 inch OD split barrel sampler.

Lamination	Up to ½" thick stratum
Layer	½" to 6"
Lens	½" to 6" discontinuous stratum, pocket
Varved	Alternating laminations of clay, silt and /or fine grained sand, or colors thereof
Dry	Powdery, no noticeable water
Moist	Below saturation
Wet	Saturated, above liquid limit
Waterbearing	Pervious - soil is below water

RELATIVE GRAVEL PROPORTIONS

TERM	RANGE
A trace of gravel	Less than 4%
A little gravel	5 – 15%
With gravel	16 – 50%

RELATIVE SIZES

Boulder	Over 12"
Cobble	3" - 12"
Gravel - Coarse	¾" - 3"
Gravel – Fine	#4 - ¾"
Sand – Coarse	#4 - #10
Sand - Medium	#10 - #40
Sand - Fine	#40 - #200
Silt & Clay	-#200, Based on Plasticity

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PRECAUTIONS FOR EXCAVATING AND REFILLING DURING COLD WEATHER

The winter season in this area presents specific problems for foundation construction. Soils which are allowed to freeze undergo a moisture volume expansion, resulting in a loss of density. These frost-expanded soils will consolidate upon thawing, causing settlement of any structure supported on them. To prevent this settlement, frost should not be allowed to penetrate into the soils below any proposed structure.

Ideally, winter excavation should be limited to areas small enough to be refilled to a grade higher than footing grade on the same day. Typically, these areas should be filled to floor grade. 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. 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.

In many cases, final grade cannot be attained in one day's time, even though small areas are worked. In the event final grade cannot be attained in one day's time, frost can be expected to develop overnight. The depth of frost penetration can be minimized by leaving a layer of loose soil on top of the compacted material overnight. However, any frost which forms in this loose layer, or snow which accumulates, should be completely removed from the fill area prior to compaction and additional soil placement. Frozen soils, or soils containing frozen material or snow should never be used as fill material.

After the structure has been enclosed, all floor slab areas should be subjected to ample periods of heating to allow thawing of the soil system. Alternatively, the frozen soils can be completely removed and be replaced with an engineered fill. The floor slab areas should be checked at random and representative locations for remnant areas of frost, and density tests should be performed to document fill compaction prior to slab placement.

Due to the potential problems associated with fill placement during cold weather, any filling operations should be monitored by a full-time, on-site soils technician. Full-time monitoring aids in detecting areas of frozen material, or potential problems with frozen material within the fill, so that appropriate measures can be taken. The choice of fill material is particularly important during cold weather, since clean granular fill materials can be placed and compacted more efficiently than silty or clayey soils. In addition, greater magnitudes of heaving can be expected with freezing of the more frost susceptible silts and clays.

If more specific frost information or cold weather data concerning other construction materials is required, please contact us.

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CONSTRUCTION OBSERVATIONS AND TESTING

- **Geotechnical Engineer's Observation**

The recommendations made in this report have been made based on the subsurface conditions found in the borings. It is possible that there are soil and water conditions on-site that were not represented by those borings. Therefore, we recommend that the completed excavation and prepared subgrade be observed and tested by a Geotechnical Engineer prior to fill placement or construction of any foundation elements. These observations are necessary to judge if all unsuitable materials have been removed from within the planned construction area and that an appropriate degree of lateral oversize has been provided for in those areas where fill will be placed below the bottom of foundation grade.

- **Field Density Tests**

We recommend a representative number of field density tests be taken in the engineered fill to aid in judging its suitability. We suggest the following guidelines relative to the number and spacing of the density tests:

- Footing Trench Areas: At least one density test should be performed for each 1½ foot depth of engineered fill placed. The lateral spacing between each 1½ foot test should not exceed 30 lineal feet.
- Floor Slab Areas: At least one density test should be performed for each 1½ foot of engineered fill depth. The density tests should be spaced so that there is a minimum of one test performed for every 2000 square feet of engineered fill placed.
- Exterior Backfill Areas: At least one density test should be performed for each 2 feet of engineered fill depth and at least one test for every 30 lineal feet of engineered fill placed.
- Utility Trench Areas: At least one density test should be performed for each 2 feet of engineered fill depth and at least one test for every 50 lineal feet of engineered fill placed.

Additional tests should be taken in confined areas, such as building corners. The actual number of tests should be left to the discretion of a qualified engineer or his representative. Any proposed engineered fill material should be submitted to the laboratory for tests to check compliance with our recommendations and project specifications.

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IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences:'
The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration, the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering* report *should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage. or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced* owners *retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering* report *whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer*

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A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory

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Soil Technologies, Inc.

28822 124th Street – Mobridge, SD 57601 – (605) 762-3406
www.soil-technologies.com

"Building Your Success On A Solid Foundation"

December 28, 2022

Willow Lake School District
c/o. Co-op Architecture
Attn: Levi Pfeil
440 E 8th St, Suite #221
Sioux Falls, SD 57103

Subj: Soil Exploration
Proposed School Addition
Willow Lake School
Willow Lake, SD
STI #22-1782

Introduction

Soil Technologies is pleased to submit to you this Addendum #1 for the above referenced project. Previously, we submitted a Soil Exploration Program report for the project dated December 22, 2022, under STI #22-1782, here after referred to as the "original report." Please attach this addendum to that original report and all of its copies.

Finished Floor

We understand that the finished floor elevation of the proposed addition may be up to 20 inches above the finished floor of the existing school. In our opinion, the finished floor elevation of up to 20 inches above the existing floor elevation will not affect our recommendations presented in the original report.

Remarks

If you have any questions regarding the contents of this addendum, or if we can be of further service to you, please contact us.

Sincerely,

Kim E. Stoecker, P.E.
President

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Willow Lake School Addition
B. Owner's Name: Willow Lake School District 12-3.
C. Architect's Name: CO-OP Architecture.

1.02 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 024100.
B. Scope of alterations work is indicated on drawings.
C. Plumbing: Alter existing system and add new construction, keeping existing in operation.
D. HVAC: Alter existing system and add new construction, keeping existing in operation.
E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.
F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
G. Telephone: Alter existing system and add new construction, keeping existing in operation.
H. Security System: Alter existing system and add new construction, keeping existing in operation.

1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
B. Arrange use of site and premises to allow:
    1. Work by Others.
    2. Work by Owner.
    3. Use of site and premises by the public.
    4. Maintain secure fence and perimeter.
C. Provide access to and from site as required by law and by Owner:
    1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
    2. Do not obstruct roadways, sidewalks, or other public ways without permit.
D. Utility Outages and Shutdown:
    1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
    2. Prevent accidental disruption of utility services to other facilities.

1.05 WORK SEQUENCE

A. Construct Work in phases during the construction period:
    1. Phase I: March, 2023 to August 9, 2024.
    2. Phase II: August 20, 2024 to May 16, 2025.
    3. Phase III: May 27, 2025 to August 15, 2025.
B. Coordinate construction schedule and operations with Owner.

END OF SECTION

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
B. Forms filled out by hand will not be accepted.
C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Forms filled out by hand will not be accepted.
C. 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.
D. Execute certification by signature of authorized officer.
E. Submit three copies of each Application for Payment.

1.04 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.

1.05 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.

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 CuYd

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 RELATED REQUIREMENTS

A. Document 002113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Operable Wall Partitions :
   1. As shown and indicated on the contract drawings, all necessary work to provide and install the operable wall partitions.

B. Alternate No. 2 - Locker Room Area Expansion :
   1. As shown and indicated on the contract drawings, all necessary work to complete the work shown on Sheet A991 including all structural, mechanical, electrical, plumbing, etc.

C. Alternate No. 3 - Walk-off Carpet at Existing Vestibules :
   1. As shown and indicated on the contract drawings, all necessary work to provide and install walk-off carpet at the existing vestibules.

D. Alternate No. 4 - Playground Equipment and Surfacing :
   1. As shown and indicated on the contract documents, provide and install new play equipment, engineered wood fiber fill, separation fabric and pea gravel. Base bid shall include the concrete playground edge and infiltration trench.

E. Alternate No. 5 - Poured-in-Place Playground Surfacing:
   1. As shown and indicated on the contract documents, provide and install pour-in-place permeable playground surfacing in lieu of engineered wood fiber fill. Alternate pricing shall include pour-in-place surfacing, as well as the concrete pad and aggregate base course. Cost should reflect a deduct for the engineered wood fiber fill, separation fabric and pea gravel, and infiltration trench.

F. Alternate No. 6 - Re-Installation of Existing Salvaged Playground Equipment:
   1. As shown and indicated on the contract documents, re-install existing salvaged play equipment at approximate location indicated. Include additional concrete playground edge, engineered wood fiber fill, separation fabric and pea gravel, and infiltration trench.

G. Alternate No. 7 - Temperature Control Work Required for the Remainder of the Existing Building That Remains:
   1. As shown and indicated on the contract documents, provide and install temperature controls for replacement of the existing building areas controls.

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. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

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. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

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

D. Limit each request to a single proposed substitution item.
   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. Architect will consider requests for substitutions only if submitted at least 5 days prior to the date for receipt of bids.

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. Other forms of submission are acceptable if all of the required information is provided.

3.03 RESOLUTION

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

3.04 ATTACHMENTS

A. A facsimile of the Substitution Request Form that may be used on the Project is included after this section.

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. Electronic document submittal service.
B. Preconstruction meeting.
C. Progress meetings.
D. Construction progress schedule.
E. Submittals for review, information, and project closeout.
F. Number of copies of submittals.
G. Submittal procedures.

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. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in PDF format.
   4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
   5. 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.
   6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.

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

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

C. 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 - SEE SECTION 013216

A. Within 10 days after date of the 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 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Submit updated schedule with each Application for Payment.

3.05 SUBMITTALS FOR REVIEW

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

B. Submit to Architect for review for the limited purpose of checking for 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.

3.06 SUBMITTALS FOR INFORMATION

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

7. Other types indicated.

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

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

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

3.08 NUMBER OF COPIES OF SUBMITTALS

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

3.09 SUBMITTAL PROCEDURES

A. 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.
B. Transmit each submittal with a copy of approved submittal form.
C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
E. 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.
F. Schedule submittals to expedite the Project, and coordinate submission of related items.
G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
I. Provide space for Contractor and Architect review stamps.
J. When revised for resubmission, identify all changes made since previous submission.
K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
L. Submittals not requested will not be recognized or processed.

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. Annotate 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. Submittals.
B. Control of installation.
C. Testing and inspection agencies and services.
D. Control of installation.
E. Mock-ups.
F. Defect Assessment.

1.02 SUBMITTALS

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

1.03 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

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. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. 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 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.

2.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

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

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

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. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
C. 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 INTERIOR ENCLOSURES

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

1.09 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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. Transportation, handling, storage and protection.
B. Product option requirements.
C. Substitution limitations and procedures.
D. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS

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

PART 2 PRODUCTS

2.01 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.

2.02 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION 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. 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.
B. Store and protect products in accordance with manufacturers' instructions.
C. Store with seals and labels intact and legible.
D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
E. For exterior storage of fabricated products, place on sloped supports above ground.
F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
G. Comply with manufacturer's warranty conditions, if any.
H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
I. Prevent contact with material that may cause corrosion, discoloration, or staining.
J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 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. Surveying for laying out the work.
F. Cleaning and protection.
G. Starting of systems and equipment.
H. Demonstration and instruction of Owner personnel.
I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 QUALIFICATIONS

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

1.04 PROJECT CONDITIONS

A. Use of explosives is not permitted.
B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 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 LAYING OUT THE WORK

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

3.05 GENERAL INSTALLATION REQUIREMENTS

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

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
    1. Verify that construction and utility arrangements are as 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.

3.07 CUTTING AND PATCHING

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

3.08 PROGRESS CLEANING

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

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.
B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
D. Verify that wiring and support components for equipment are complete and tested.
E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 017900 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

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

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
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.

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: 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 and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

2.02 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
C. 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.

2.03 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.

2.04 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

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 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.
B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.
B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.
C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

2.01 SCOPE

A. Remove all items as specified on the contract Drawing Sheets.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
B. Do not begin removal until receipt of notification to proceed from Owner.
C. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

2.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

2.04 SELECTIVE DEMOLITION FOR 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 demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.
2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
    1. Prevent movement of structure; provide shoring and bracing 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.
    4. Patch as specified for patching new work.

2.05 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

SECTION 030516
UNDERSLAB VAPOR BARRIER - STEGO

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. 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 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.
B. Slabs-on-grade.
C. Concrete foundation walls and footings.
D. Concrete reinforcement.
E. Joint devices associated with concrete work.
F. Concrete curing.

1.02 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
B. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010.
C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
E. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
F. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Billet-Steel Bars for Concrete Reinforcement; 2013.
H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.
J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2013.
K. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2012.
M. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
C. Mix Design: Submit proposed concrete mix designs.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
    1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
    1. Type: Deformed billet-steel bars.
    2. Finish: Unfinished, unless otherwise indicated.

B. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage (1.5 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type.
   1. Acquire all cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire all aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.
D. Water: Clean and not detrimental to concrete.
E. Fiber Reinforcement: Alkali-resistant polypropylene complying with ASTM C1116/C1116M.
   1. Fiber Length: 0.25 inch (6 mm), nominal.

2.04 BONDING AND JOINTING PRODUCTS

A. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.

2.05 CONCRETE MIX DESIGN

A. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cubic meter), or as recommended by manufacturer for specific project conditions.
B. Footings and Foundation Walls:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,500 pounds per square inch (20.7 MPa).
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 45 percent by weight.
   4. Total Air Content: 6 percent plus or minus 1.5 percent at point of delivery, determined in accordance with ASTM C173/C173M.
   5. Maximum Slump: 4 inches (100 mm), plus or minus 1 inch (25 mm).
   6. Maximum Aggregate Size: 1-inch (25 mm).

C. Slabs-on-Grade:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (31 MPa).
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Minimum Cementitious Materials Content: 520 lb/cu. yd (309 kg/cu. m).
   4. Total Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
   5. Maximum Slump: 4 inches (100 mm), plus or minus 1 inch (25 mm).
   6. Maximum Aggregate Size: ¾-inch (19 mm).

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
B. Verify that forms are clean and free of rust before applying release agent.
C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.
B. Place concrete for floor slabs in accordance with ACI 302.1R.
C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.
B. Anchor joint fillers and devices to prevent movement during concrete placement.
C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 ft (3 m).
   2. Under Seamless Resilient Flooring: 1/4 inch (6 mm) in 10 ft (3 m).
   3. Under Carpeting: 1/4 inch (6 mm) in 10 ft (3 m).
B. Correct the slab surface if tolerances are less than specified.
C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   2. Decorative Exposed Surfaces: "Steel trowel" as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to be polished, and all other slab surfaces.

3.08 CURING AND PROTECTION

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

3.09 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

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

3.11 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing and inspecting agency to perform field tests and inspection and to prepare test reports.

END OF SECTION

SECTION 033511
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
B. Mock-Up Size: 10 feet square.
C. Locate where directed.
D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
B. Do not finish floors until interior heating system is operational.
C. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 DENSIFIERS AND HARDENERS

A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
    1. Composition: Lithium silicate.
    2. Products:
        a. ARDEX Engineered Cements; ARDEX PC-50: www.ardexamericas.com/#sle.
        b. Euclid Chemical Company; ULTRASIL LI+: www.euclidchemical.com/#sle.
        c. PROSOCO, Inc; Consolideck LS: www.prosoco.com/consolideck/#sle.
        d. Surface Koatings, Inc; Aqualon L-100: www.surfkoat.com/#sle.
        e. Basis of Design: SpecChem, LLC; LithSeal SC.
        f. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.
B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
B. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION

SECTION 034500
PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural precast concrete wall panels with integral insulation and precast accent units.
B. Supports, anchors, and attachments.
C. Grouting under panels.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Admixtures.
B. Section 079200 - Joint Sealants: Sealing perimeter and intermediate joints.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete 2019, with Errata (2021).
B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength 2014.
D. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric) 2014.
E. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.
F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
G. ASTM C150/C150M - Standard Specification for Portland Cement 2021.
H. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.
I. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.
J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.
K. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars 2018a.
L. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2020.
M. ASTM F436 - Standard Specification for Hardened Steel Washers 2011.
N. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2021).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a minimum of one week prior to commencing work of this section.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
    1. Include details of mix designs.
    2. Include structural design calculations.
D. Samples: Submit two 1" thick, 12 by 12 inch in size, illustrating surface finish, color and texture.
E. Integrally Insulated Panel System Manufacturer's Installation Instructions: Submit manufacturer's current installation instructions for system specified. Certify that copies are available at fabrication site prior to start of precast fabrication
F. Integrally Insulated Panel System Design Data:

1. Thermal Resistance: Submit calculations complying with ASHRAE Std 90.1 I-P, isothermal planes method, and demonstrating thermal resistance of integrally insulated panel system.

G. Maintenance Data: Indicate surface cleaning instructions.

1.06 QUALITY ASSURANCE

A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.
B. Fabricator Qualifications:
   1. Firm having at least 5 years of documented experience in production of precast concrete of the type required.

1.07 MOCK-UP

A. Provide one mock-up, 4 feet long by 4 feet wide, with lifting device, and attachment points, and finish in accordance with approved sample.
B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handling: Lift and support precast units only from support points.
B. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.
C. Protect units to prevent staining, chipping, or spalling of concrete.
D. Mark units with date of production in location that will be concealed after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Precast Concrete:
   1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see www.pci.org/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PRECAST UNITS

A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
   1. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
   2. Calculate structural properties of units in accordance with ACI 318.
   3. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   4. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.

B. Finish Type Color 1: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance. Per Architect's sample:
   1. Grey Cement.
   2. 50% Granite Falls 3/4 aggregates.
   3. 50% Larson #7 Key aggregates.

2.03 REINFORCEMENT

A. Steel Welded Wire Reinforcement (WWR): Plain type ASTM A1064/A1064M.
   1. Form: Flat Sheets.

2.04 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
B. Other Cementitious Materials:
   1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.

2. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
3. Silica Fume: Comply with ASTM C1240.

C. Fine and Coarse Structural Aggregates: ASTM C33.
D. Lightweight Structural Aggregate: ASTM C330.
E. Surface Finish Aggregate: Conforming to sample in office of Architect.
F. Finish: Sandblast finish.
G. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).
H. Water: Clean and not detrimental to concrete.
I. Grout:
   1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.05 SUPPORT DEVICES

A. Bolts, Nuts, and Washers: ASTM A325 (A 325M) heavy hex structural bolts, Type 1, plain, with matching ASTM A563 (A563M) nuts, and washers as follows:
   1. Standard Washers: ASTM F436 washers, in finish matching bolts.

2.06 INTEGRALLY INSULATED PANEL SYSTEM (TRUSS CONNECTORS)

A. Integrally Insulated Panel System: Precast concrete panel formed from two layers of concrete with rigid insulation and non-conducting truss connectors between layers.
   1. Connectors: System manufacturer's standard; epoxy coated, interlaid carbon fiber mesh.
   2. Continuous Insulation: Rigid expanded polystyrene (EPS) board insulation; ASTM C578, Type II.

2.07 INSULATION

A. Integral Insulation: Rigid extruded polystyrene (XPS) board insulation.

2.08 ACCESSORIES

A. Bearing Pads: High density plastic; Shore A Durometer .; 1/8 inch thick, smooth both sides.

2.09 FABRICATION

A. Maintain consistent quality during manufacture.
B. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
C. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
D. Integrally Insulated Panel System: Comply with manufacturer's written installation instructions.
E. Remove protective coating from thin brick using method recommended by manufacturer. Do not damage brick or concrete material in joints.

2.10 FABRICATION TOLERANCES

A. Conform to PCI MNL-117 and PCI MNL-135.
   1. Maximum Variation From Nominal Face Dimensions: Plus or minus 3/32 in.
   2. Maximum Variation From Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
   3. Maximum Variation from Thickness: Plus or minus 1/8 in.
   4. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
   5. Maximum Bowing of Members: Plus or minus length/360.

2.11 ACCESSORIES

A. Bearing Pads: High density plastic; Shore A Durometer; 1/8 inch thick, smooth both sides.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

A. All Cranes, operators and welders need to be certified.
B. Erect units without damage to shape or finish. Replace or repair damaged panels.
C. Erect units level and plumb within allowable tolerances.
D. Align and maintain uniform horizontal and vertical joints as erection progresses.
E. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.
F. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M.
G. Provide non-combustible shields during welding operations.
H. Touch-up field welds and scratched or damaged primed painted surfaces.
I. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-135.
    1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.
    2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
    3. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
    4. Exposed Joint Dimension: Plus or minus 3/16 inch.
    5. Maximum Jog in Alignment of Matching Faces or Edges: Plus or minus 3/16 inch.
    6. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.
B. Clay Facing Brick.
C. Mortar and Grout.
D. Reinforcement and Anchorage.
E. Flashings.
F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Loose steel lintels.
B. Section 061000 - Rough Carpentry: Nailing strips built into masonry.
C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
F. ASTM C91/C91M - Standard Specification for Masonry Cement 2018.
G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.
H. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale) 2019.
J. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019.
K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.
L. ASTM C476 - Standard Specification for Grout for Masonry 2020.
M. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls 2017.
N. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
C. Samples: Submit panel samples of facing brick units to illustrate color, texture, and extremes of color range.
D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

1.07 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 4 feet long by 4 feet high; include mortar, accessories, and flashings (with lap joint, corner, and end dam) in mock-up.

1.08 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.02 BRICK UNITS

A. Manufacturers:
   1. Belden Brick; Belcrest: www.beldenbrick.com.
   2. Boral Bricks, Inc: www.boralbricks.com/#sle.
   3. Endicott Clay Products Co: www.endicott.com/#sle.
   4. Glen-Gery Co..
   5. Substitutions: See section 016000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBX, Grade SW.
   1. Color and texture: Match existing. Sample to be approved by Architect.
      a. Brick 1: Mix of Endicott Medium Ironspot 46 Velour Modular (60%) and Endicott Medium Ironspot 77 Velour Modular (40%).
      b. Brick 2: Glen-Gery Light Buff Matt
   2. Modular size: As indicated on drawings.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.
B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.
C. Mortar Aggregate: ASTM C144.
D. Grout Aggregate: ASTM C404.
E. Water: Clean and potable.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Blok-Lok Limited: www.blok-lok.com/#sle.
   2. Hohmann & Barnard, Inc; 2-Seal Tie: www.h-b.com/#sle.
   3. WIRE-BOND: www.wirebond.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.
B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
D. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

F. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 FLASHINGS

A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gage, 0.0187 inch thick; finish 2B to 2D.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com/#sle.
      b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
      c. WIRE-BOND: www.wirebond.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products Inc; Mortar Break DT: www.advancedflashing.com/#sle.
         2) Mortar Net Solutions: www.mortarnet.com.
         3) Substitutions: See Section 016000 - Product Requirements.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.
D. Drip Edge: Stainless steel; compatible with membrane and adhesives.
E. Type: Polyester mesh.
F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXES

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

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

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

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Remove excess mortar and mortar smears as work progresses.
D. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
G. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.
B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

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

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 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 to within 1/4 inch of exterior face of masonry.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.12 BUILT-IN WORK

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

3.13 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CLEANING

A. Remove excess mortar and mortar droppings.
B. Clean soiled surfaces with cleaning solution.

3.15 PROTECTION

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

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 2100 - Steel Joist Framing.
B. 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.; 2011.
B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.
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:
    1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
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.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
B. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
C. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.
B. Steel W Shapes and Tees: ASTM A992/A992M.
C. Rolled Steel Structural Shapes: ASTM A992/A992M.
D. Steel Plate: ASTM A514/A514M.
E. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A galvanized to ASTM A 153/A 153M, Class C.

F. Welding Materials: AWS D1.1; type required for materials being welded.
G. 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.
H. 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.

2.03 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.

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. Do not field cut or alter structural members without approval of Architect.
D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 052100
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joists, with bridging, attached seats and anchors.
B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
C. Supplementary framing for roof openings greater than 18 inches (450 mm).

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.
B. Section 05 3100 - Steel Decking: Bearing plates and angles.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
D. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
E. SJI (SPEC) - Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders; Steel Joist Institute; 2011.
F. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).
G. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
D. Manufacturer's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Nucor-Vulcraft Group: www.vulcraft.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Open Web Joists: SJI Type K and DLH Joists:
   1. Minimum End Bearing on Steel Supports: As shown on the drawings.
   2. Minimum End Bearing on Concrete or Masonry Supports: As shown on drawings.
   3. Finish: Shop primed.
B. Anchor Bolts, Nuts and Washers: ASTM A 307, hot-dip galvanized per ASTM A 153/A 153M, Class C.
C. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.
D. Welding Materials: AWS D1.1; type required for materials being welded.
E. Shop and Touch-Up Primer: SSPC-Paint 25, zinc oxide, complying with VOC limitations of authorities having jurisdiction.

2.03 FINISH

A. Shop prime joists as specified.
B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.
B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
E. Install supplementary framing for floor and roof openings greater than 18 inches (450 mm).
F. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
G. Do not field cut or alter structural members without approval of joist manufacturer.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).
B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 053100
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical roof deck.
B. Roof deck.
C. Supplementary framing for openings up to and including 18 inches (450 mm).
D. Bearing plates and angles.
E. Acoustical insulation in roof deck flutes.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches (450 mm) and shear stud connectors.
B. Section 05 2100 - Steel Joist Framing: Support framing for openings larger than 18 inches (450 mm) and shear stud connectors.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
C. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
D. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2008.
E. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
    1. Cordeck, Inc: www.cordeck.com.
    2. Nucor-Vulcraft Group: www.vulcraft.com.

2.02 STEEL DECK

A. Acoustical Roof Deck: Non-composite type, steel sheet with plain vertical flute faces perforated with 1/8 inch (3 mm) diameter holes staggered 3/8 inch (10 mm) on center:
    1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
    2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
    3. Minimum Metal Thickness, Excluding Finish: 22 gage (0.8 mm).
    4. Nominal Height: 1-1/2 inch (38 mm).
    5. Profile: Fluted; SDI NR.
    6. Side Joints: Lapped, welded.
    7. End Joints: Lapped, welded.

B. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Minimum Metal Thickness, Excluding Finish: 22 gage (0.8 mm).
   3. Nominal Height: 1-1/2 inch (38 mm).
   4. Profile: Fluted; SDI NR.
   5. Formed Sheet Width: 24 inch (600 mm).
   6. Side Joints: Lock seam.
   7. End Joints: Lapped, welded.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
B. Welding Materials: AWS D1.1.
C. Fasteners: Galvanized hardened steel, self tapping.
D. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft (18 kg/cu m) density; profiled to suit deck.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage (0.8 mm) thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. On steel supports provide minimum 1-1/2 inch (38 mm) bearing.
B. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
   1. Welding: Use fusion welds through weld washers.
C. Clinch lock seam side laps.
D. At welded male/female side laps weld at 18 inches (450 mm) on center maximum.
E. Weld deck in accordance with AWS D1.3.
F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 054000
FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.
B. Exterior wall sheathing.
C. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 04 2001 - Masonry Veneer: Veneer masonry supported by wall stud metal framing.
B. Section 05 3100 - Steel Decking.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
D. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.
E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. The Steel Network, Inc: www.SteelNetwork.com.
   4. MBA Metal Framing: www.mbastuds.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Simpson Strong Tie: www.strongtie.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
B. Framing Connectors: Factory-made, formed steel sheet.

1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for thicknesses less than 10 gage (0.118 inch) (3 mm), and factory punched holes and slots.
2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members.
3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
B. Water-Resistive Barrier: As specified in Section 07 2500.

2.05 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
B. Anchorage Devices: Powder actuated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.
B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches (600 mm) on center. Coordinate installation of sealant with floor and ceiling tracks.
C. Place studs at 16 inches (400 mm) on center; not more than 2 inches (50 mm) from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.
D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

3.03 WALL SHEATHING

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
    1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.
B. Prefabricated ladders.
C. Bollards

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.
B. Section 055100 - Metal Stairs.
C. Section 055213 - Pipe and Tube Railings.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements 2008 (Reaffirmed 2018).
C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
J. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes 2012.
K. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric) 2012.
L. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2012.
M. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric) 2012.
N. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
O. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
P. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
Q. AWS D1.2/D1.2M - Structural Welding Code - Aluminum 2014, with Errata (2020).
R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
S. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.
T. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.
B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
C. Plates: ASTM A283/A283M.
D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
F. Slotted Channel Fittings: ASTM A1011/A1011M.
G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
H. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy , T6 temper.
D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy , T6 temper.
E. Bolts, Nuts, and Washers: Stainless steel.
F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
C. Lintels: As detailed; prime paint finish.

2.05 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
    1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
    2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
    3. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.
    4. Products: Basis of Design- Okeeffe's Inc.; Model 503 & 503A.
        a. Industrial Ladder & Scaffolding, Inc.: www.anyladder.com/sle.
        b. Substitutions: See Section 016000 - Product Requirements.

2.06 FINISHES - STEEL

A. Prime paint steel items.
    1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.

2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Prime Painting: One coat.

2.07 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I natural anodized.
B. Interior Aluminum Surfaces: Class I natural anodized.
C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.08 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

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

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.
B. Stair railings and guardrails.
C. Free-standing railings at steps.
D. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
B. Section 055100 - Metal Stairs: Attachment plates for handrails specified in this section.
C. Section 099000 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.
E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).
F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
C. Samples: Submit two, 6 inch long samples of handrail and guardrail. Submit two samples of elbow, wall bracket, and end stop.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
C. Fabricator Qualifications:
    1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Handrails, Railings, Guardrails and Aluminum Balconies:
    1. Alumi-Guard: www.alumi-guard.com/sle.
    2. C.R. Laurence Company, Inc: www.crl-arch.com/sle.
    3. Kee Safety, Inc: www.keesafety.com.
    4. KaneSterling: www.sterlingdula.com.
    5. The Wagner Companies: www.wagnercompanies.com.
    6. Substitutions: See Section 016000 - Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
D. Allow for expansion and contraction of members and building movement without damage to connections or members.
E. Dimensions: See drawings for configurations and heights.
F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.
C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
E. Exposed Fasteners: No exposed bolts or screws.
F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.
B. Fit and shop assemble components in largest practical sizes for delivery to site.
C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
D. Welded Joints:
    1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
    2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
    3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
D. Anchor railings securely to structure.
E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Install smoke baffles assemblies in accordance with manufacturer's written instructions. Securly attach mounting clamps to building structure; insert structural glass smoke baffle panels within clamps and fasten.

3.04 TOLERANCES

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

END OF SECTION

SECTION 055305
METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed metal floor gratings.
B. Flat surface floor and stair tread plating.
C. Perimeter closure.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

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 2017.
C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
E. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates 2015 (Reapproved 2021).
F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
G. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.
H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.
J. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
K. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual 2019.
L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
M. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.
N. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide span and deflection tables.
C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.
    1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
    2. Include the design engineer's seal and signature on each sheet of shop drawings.
D. Samples: Submit two samples, 6 by 6 inch in size illustrating surface finish, color, and texture.
E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
F. Manufacturer's Installation Instructions: Indicate special requirements for opening and perimeter framing.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a licensed Professional Engineer experienced in design of this type of work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Neenah Foundry Company
B. Ross Technology Corporation: www.rosstechnology.com/#sle.

C. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Comply with applicable code for loading requirements.
B. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.
C. Design Live (Light Vehicle) Load: Uniform load of 500 lb/sq ft minimum; concentrated load of 2000 lbs.
D. Maximum Allowable Deflection Under Live Load: 1/240 of span; size components by single support design.
E. Maximum Spacing Between Bars: To restrict pedestrian shoe heels.

2.03 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.
B. Sheet Steel for Die Stamping: ASTM A1011/A1011M Designation CS hot-rolled sheet.
C. Steel For Welding or Riveting: ASTM A36/A36M unfinished, of shapes indicated.
D. Steel Sheet for Lock Forming: Hot-dipped galvanized, ASTM A653/A653M, FS Type B, with G90/Z275 coating.
E. Steel Framing: ASTM A36/A36M shapes, unfinished.
F. Cross Bars: ASTM B211/B211M solid bars.
G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.04 ACCESSORIES

A. Fasteners and Saddle Clips: Galvanized steel:
B. Perimeter Closure: Of same material as grating.

2.05 FABRICATION

A. Fabricate grates and plates to accommodate design loads.
B. Mechanically clinch joints of intersecting metal sections.
C. Fabricate support framing for openings.

2.06 FINISHES

A. Prepare surfaces to be primed in accordance with SSPC-SP 2.
B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
C. Do not prime surfaces in direct contact with concrete or where field welding is required.
D. Galvanizing for Steel Shapes: ASTM A123/A123M.
E. Galvanizing for Steel Hardware: ASTM A153/A153M.
F. Non-Slip Surfacing: Aluminum oxide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.
B. Verify that opening sizes and dimensional tolerances are acceptable.
C. Verify that supports are correctly positioned.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.
B. Place frames in correct position, plumb and level.
C. Mechanically cut galvanized finish surfaces. Do not flame cut.
D. Set perimeter closure flush with top of grating and surrounding construction.
E. Secure to prevent movement.

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.
B. Sheathing.
C. Subflooring.
D. Roofing nailers.
E. Preservative treated wood materials.
F. Miscellaneous framing and sheathing.
G. Communications and electrical room mounting boards.
H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
E. AWPA U1 - Use Category System: User Specification for Treated Wood 2022.
F. PS 20 - American Softwood Lumber Standard 2021.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 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.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
    1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
    2. 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.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.
B. Moisture Content: S-dry or MC19.
C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Underlayment: APA Underlayment; plywood, Exposure 2, 3/4 inch thick.
B. Wall Sheathing: 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.

2.04 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.
B. Water-Resistive Barrier: As specified in Section 072500.

2.05 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. Fire Retardant Treatment:
   1. Manufacturers:
      a. Lonza Group: www.wolmanizedwood.com/#sle.
      b. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
      c. Koppers, Inc: www.koppersperformancechemicals.com/#sle.
      d. Viance, LLC: www.treatedwood.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.
   2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Do not use treated wood in direct contact with the ground.
   3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. 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, flashing, or waterproofing.

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. 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 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.
   10. Other accessories and areas indicated on the drawings.

3.04 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 prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail 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.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.
B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 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 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.
B. Cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than 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. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
    1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
C. Product Data: Provide data for hardware accessories.
D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 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: Doweled.
    7. Drawer Construction Technique: Dowel joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Wilsonart: www.wilsonart.com.
   3. 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.

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; Sill Supports: www.rakks.com/#sle
D. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
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. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation current edition.
B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).
C. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor 2013a.
D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
E. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2022.
F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
G. FDA Food Code - Chapter 6 - Physical Facilities Current Edition.
H. FM 4880 - Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials 2017.

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 6 by 6 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.
    2. Extra Panels: Quantity equal to 5 percent of total installed.

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.
    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. FRP Wall Panels:
    1. Panel Size: 4 by 10 feet.
    2. Panel Thickness: 0.09 inch.
    3. Surface Design: Smooth.
    4. Color: Light Grey.
    5. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

A. FRP Panels: Fiberglass reinforced plastic, 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.
2. Class 1 fire rated when tested in accordance with FM 4880.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
5. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
6. Sanitation and Cleanability: Comply with 9 CFR 416.2.
7. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.

B. Trim: Vinyl; 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 071400
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete substrate.
B. Section 072100 - Thermal Insulation: Insulation used for protective cover.

1.03 REFERENCE STANDARDS

A. NRCA (WM) - The NRCA Waterproofing Manual 2021.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polyurethane Waterproofing:
   1. AVM Industries, Inc: www.avmindustries.com/#sle.
   2. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/#sle.
   3. CETCO, a division of Minerals Technologies Inc; [____]: www.mineralstech.com/#sle.
   4. Karnak Corporation; [____]: www.karnakcorp.com/#sle.
   5. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
   6. Tremco Commercial Sealants & Waterproofing; TREMproof 250GC: www.tremcosealants.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 FLUID APPLIED WATERPROOFING MATERIALS

A. Polyurethane Waterproofing: Cold-applied one or two component polyurethane, complying with ASTM C836/C836M.
   1. Tensile Strength: 400 psi, measured in accordance with ASTM D412.
   2. Ultimate Elongation: 180 percent, measured in accordance with ASTM D412.
   3. Permeance: 0.073 perms, measured in accordance with ASTM E96/E96M.
   4. Brittleness Temperature: Based on minus 50 degrees F, measured in accordance with ASTM D746.

2.03 ACCESSORIES

A. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.
B. Protection Board: Rigid insulation specified in Section 072100.
C. Drainage Panel: 1/4 inch thick formed plastic, hollowed sandwich.
D. Cant Strips: Premolded composition material.
E. Counterflashings: As recommended by membrane and protection board manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.
B. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.
C. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

D. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.
B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.
C. At joints and cracks less than 1/2 inch in width including joints between horizontal and vertical surfaces, apply 12 inch wide strip of joint cover sheet.
D. At joints from 1/2 inch to 1 inch in width, loop joint cover sheet down into joint between 1-1/4 inch to 1-3/4 inch, and extend sheet at least 6 inches on either side of expansion joint.
E. Apply extra thickness of waterproofing material at corners, intersections, and angles.
F. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
G. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward, and scribe and cut boards around projections, penetrations, and interruptions.
B. Place protection board directly against drainage panel; butt joints, and scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

A. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.
    1. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.
    2. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.
    3. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, and underside of floor slabs.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.
B. Section 042723 - Cavity Wall Unit Masonry: Masonry walls enclosing insulation.
C. Section 061000 - Rough Carpentry: Supporting construction for batt insulation.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.
B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.
E. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

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 MANUFACTURERS

2.02 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) carbon black board.
D. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

2.03 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) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Size: 15-3/4 inch by 96 inch.
   5. Board Thickness: 1-3/4 inch.
   6. Board Edges: Square.

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.

B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

C. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

D. Wire Mesh: Galvanized steel, hexagonal wire mesh.

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 AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

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 framed walls.
   2. In exterior wall crevices.
   3. At junctions of dissimilar wall and roof materials.

B. Foamed-in-place masonry insulation.

1.02 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 2022.
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).

1.03 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's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
D. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
E. 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.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.05 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; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.
   2. Bayer MaterialScience; EcoBay CC : www.spf.bayermaterialscience.com.
   3. Demilec LLC; DEMILEC APX: www.demilec.com/#sle.
   4. Henry Company; PERMAX 0.5: www.henry.com.
   5. Icynene Inc; Icynene Classic LD-C-50: www.icynene.com/#sle.
   6. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

B. Foamed-In-Place Masonry Insulation:
   1. Tailored Chemical Products: Core-Fill 500.
   2. 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. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
   2. 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.
   3. Water Vapor Permeance: Vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   5. 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.
   6. Closed Cell Content: At least 90 percent.
   7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   2. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class (“OITC”) rating of 44 for 8” wall assembly (ASTM E 90-90).

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 APPLICATION OF FOAMED-IN-PLACE MASONRY INSULATION

A. Apply insulation in accordance with manufacturer's instructions.
B. Install foamed-in-place insulation from interior prior to installation of interior finish work and after all masonry and structural concrete work is in place.
C. Fill all open cells and voids in hollow concrete masonry walls where shown on drawings.
D. The foam insulation shall be pressure injected through a series of 5/8” to 7/8” holes drilled into every vertical column of block cells (every 8” on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled.

E. Patch holes with mortar and score to resemble existing surface.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 072500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).
B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on material characteristics.
C. Shop Drawings: Provide drawings of special joint conditions.
D. Manufacturer's Installation Instructions: Indicate preparation.

1.04 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier coating, fluid applied type.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Coating:
   1. Dry Film Thickness (DFT): 10 mil, 0.010 inch, minimum.
   2. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   3. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B (Water Method) at 73.4 degrees F.
   4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to four months of weather exposure after application.
   5. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
   6. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   7. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
   8. Sealants, Tapes and Accessories: As recommended by coating manufacturer.

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. Thinners and Cleaners: As recommended by material manufacturer.

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. Coatings:
    1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
    2. Use flashing to seal to adjacent construction and to bridge joints.
D. 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. Do not cover installed weather barriers until required inspections have been completed.

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 072100 - Thermal Insulation: Rigid roof insulation.
C. 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 A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 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. 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: Basis of Design: Magna-Loc Panel by Metal Sales Manufacturing Corp.
   1. Firestone Building Products LLC: www.firestonebpco.com.
   2. Metl-Span, a Division of NCI Group, Inc: www.metlspan.com.
   3. Petersen Aluminum Corporation: www.pac-clad.com.
   4. 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. Steel Thickness: Minimum 24 gage (0.024 inch).
   2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system for field seaming with special tool.
   3. Length: Full length of roof slope, without lapped horizontal joints.
   4. Width: Maximum panel coverage of 18 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 indicated on drawings.

2.06 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, caps, and equipment curbs 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.
B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
   1. Seam Sealant: Factory-applied, non-skinning, non-drying type.
C. 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. Sheet Thickness: 22 mil (0.022 inch) minimum total thickness.
2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
3. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
4. Water Vapor Permeance: 0.067 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).

2.07 FABRICATION

A. Panels: Fabricate panels and accessory items at factory, using manufacturer92s 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.

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 and soffits, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Weather barrier under wall panels.
B. Section 092116 - Gypsum Board Assemblies: Wall panel substrate.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
C. Samples: Submit one samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
B. Installer Qualifications: Company specializing in installing the products specified in this section with minimum three years of documented experience.

1.05 MOCK-UP

A. Construct mock-up, 8 feet long by 4 feet wide; include panel and soffit system, glazing, 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.
C. Mock-up may remain as part of the Work.

1.06 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.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective work within a five year period after the Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Metal Wall Panels: PAC-CLAD; Product Precision Series Highline B2.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
    1. Provide exterior panels and subgirt framing assembly.
    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. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.

B. Exterior Panels: MP-1
1. Profile: Highline B2.
2. Material: Precoated steel sheet, 22 gage, 0.0299 inch minimum thickness.
3. Panel Width: 15.356"
4. Rib Height: 1-3/8"
5. Color: As selected by Architect from manufacturer's full line.

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. Provide trim to cover back-up framing where occurs- coordinate with drawings.
E. Anchors: Galvanized steel or Stainless steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

2.05 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
B. Concealed Sealants: 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.
1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

D. Touch-up Paint: As recommended by panel manufacturer.
E. U-edging for PM-1 & PM-2: Type 402 U-edging; 1/8" opening x 1" width; 18 gaugeField
F. Bituminous Paint: Asphalt base.

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

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 075323
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (EPDM) - FIRESTONE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. EPDM membrane roofing system, including all components specified.
B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
C. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.
D. Commencement of work by Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.
B. Section 076200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
B. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board 2020.
C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2022a.
E. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics 2016.
F. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics 2020.
G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
H. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements 2021.
I. PS 20 - American Softwood Lumber Standard 2021.
J. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
    1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
    2. Notify Architect well in advance of meeting.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data:
    1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
C. Shop Drawings: Provide:

1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
2. For tapered insulation, provide project-specific layout and dimensions for each board.

D. Specimen Warranty: Submit prior to starting work.
E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
F. Executed Warranty.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have the following:
1. Current approval, license, or authorization as applicator by the manufacturer.
2. At least five years experience in installing specified system.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
B. Store materials clear of ground and moisture with weather protective covering.
C. Keep combustible materials away from ignition sources.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
C. Warranty: Limited 20 Year Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
1. Limit of Liability: No dollar limitation.
2. Scope of Coverage: Repair leaks in the roofing system caused by:
a. Ordinary wear and tear of the elements.
b. Manufacturing defect in brand materials.
c. Defective workmanship used to install these materials.
d. Damage due to winds up to 90 mph.
3. Not Covered:
a. Damage due to winds in excess of 55 mph.
b. Damage due hurricanes or tornadoes.
c. Hail.
d. Intentional damage.
e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

D. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, roof pavers, for the following warranty period:
1. Warranty Period: Two (2) years from Date of Substantial Completion.

E. Comply with Manufacturer's requiremnts where patching the existing roof to maintain warranty at existing roof areas.
F. Metal Roof Edging: Firestone full-system warranty for roof edge system, covering blow-off from winds up to 90 mph.
G. Metal Roof Edging with Exposed Decorative Fascia: Provide 20 year warranty for painted finish covering color fade, chalk, and film integrity.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System: Basis of Design: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com.
1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets

the following qualifications:

a. Specializing in manufacturing the roofing system to be provided.
b. Other manufacturers desiring approval shall submit requests to the Architect. Requests shall include PART 2- Products to show compliance with these specifications.
c. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:
    1) Carlisle Syntec Systems.
    2) Versico Roofing Systems.
    3) Johns Manville.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
    1. Metal roof edging products by other manufacturers are not acceptable.
D. Substitutions: See Section 016000 - Product Requirements.
    1. Submit evidence that the proposed substitution complies with the specified requirements.

2.02 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.
    1. Membrane Attachment: Fully adhered.
    2. Warranty: Full system warranty; Firestone 20 year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
    3. Comply with applicable local building code requirements.
    4. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals' markings.
        a. Fire/Windstorm Classification: Class 1A-90.
B. Roofing System Components: Listed in order from the top of the roof down:
    1. Membrane: Thickness as specified.
    2. Insulation Cover Board: High density polyisocyanurate; mechanically attached
    3. Insulation:
        a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.
        b. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on top.
        c. R-value: R-30, minimum roof insulation at roof drains.
        d. Top Layer: Polyisocyanurate foam board, non-composite; mechanically fastened. See drawings for locations of attachment method.
        e. Bottom Layer: Polyisocyanurate foam board, non-composite; mechanically fastened. See drawings for locations of attachment method.
        f. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.
    4. Vapor Retarder: One layer SBS modified bitumen base sheet; cold adhesive attached.
    5. Deck Cover Board (at areas indicated on drawings only): Gypsum-based board, 1/4 inch thick; loose-laid, no attachment.

2.03 EPDM MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: Black, cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
    1. Thickness: 0.060 inch.
    2. Sheet Width: Provide the widest available sheets to minimize field seaming.
B. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D4811 Type II, and with the following properties:
C. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil EPDM tape adhesive; QuickSeam Flashing by Firestone.

D. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.
E. Self-Adhesive Lap Splice Tape: 35 mil EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam Splice Tape by Firestone.
F. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Firestone.
G. Bonding Adhesive: Neoprene-based, formulated for compatibility with EPDM membrane and wide variety of substrate materials, including masonry, wood, and insulation facings; Bonding Adhesive BA-2004 by Firestone.
H. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive; QuickPrime Plus by Firestone.
I. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.
J. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.
K. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.
L. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria.
M. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick; Firestone Termination Bar by Firestone.

2.04 VAPOR RETARDER MATERIALS

A. Base Sheet: SBS polymer-modified bitumen sheet, complying with ASTM D6163/D6163M, Type I, Grade S, with glass fiber reinforcing fabric, formulated for hot asphalt and cold adhesive application to substrate and cap sheet; Firestone SBS Base.
B. Adhesive: As recommended by roofing membrane manufacturer.

2.05 ROOF INSULATION AND COVER BOARDS

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: To meet R-30, minimum (See Drawings).
   2. Size: 48 inches by 96 inches, nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
   3. Compressive Strength: 20 psi when tested in accordance with ASTM C1289.
   4. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   5. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant, high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:
   1. Basis of Design: Firestone ISOGARD HD
   2. Size: 48 inches by 96 inches, nominal.
   3. Thickness: 1/2 inch.
   4. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C518 and ASTM C177.
   5. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C209.
   6. Compressive Strength: 120 psi, when tested in accordance with ASTM D1621.
   7. Density: 5 pcf, when tested in accordance with ASTM D1622/D1622M.
   8. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
   9. Mold Growth Resistance: Passing ASTM D3273.
C. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

2.06 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
   1. Wind Performance:
      a. Membrane Pull-Off Resistance: 100 lbs/ft, minimum, when tested in accordance with ANSI/SPRI/FM 4435/ES-1 Test Method RE-1, current edition.
      b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 Test Method RE-2, current edition.
      c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.
   2. Fascia Face Height: 5 inches.
   3. Edge Member Height Above Nailer: 1-1/4 inches.
   4. Length: 144 inches.
   5. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
   6. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
   7. Anchor Bar Cleat: 20 gage, 0.036 inch G90 coated commercial type galvanized steel with pre-punched holes.
   8. Curved Applications: Factory modified.
   9. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
   10. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch long legs on corner pieces.
   11. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings. BY ROOF MANUFACTURER.

2.07 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches, nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

PART 3 INSTALLATION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
D. Perform work using competent and properly equipped personnel.
E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.04 VAPOR RETARDER

A. Before installing insulation install vapor retarder directly over the deck.

B. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

3.05 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install insulation in a manner that will not compromise the vapor retarder integrity.

C. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

D. Lay roof insulation in courses parallel to roof edges.

E. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

F. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

G. Cold Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

3.06 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
D. Install membrane adhered to the substrate, with edge securement as specified.
E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
    1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
    2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.07 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
    1. Follow roofing manufacturer's instructions.
    2. Remove protective plastic surface film immediately before installation.
    3. Install water block sealant under the membrane anchorage leg.
    4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
    5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
    6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
    7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
    1. Use the longest practical flashing pieces.
    2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
    3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
    4. Provide termination directly to the vertical substrate as shown on roof drawings.
D. Roof Drains:
    1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
    2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
    3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
    4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
    5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.

1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
2. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.
3. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.08 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
   1. Do not install walkway pads within 10 feet of any roof edge or perimeter -- these areas require loose-laid pavers as walking surfaces.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.09 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
B. Perform all corrections necessary for issuance of warranty.

3.10 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

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.
D. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood nailers for sheet metal work.
B. 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 2022.
C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).
G. 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. 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.

2.02 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 07 9005.
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. Downspouts: Rectangular profile. Color to match roof assembly.
B. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.
C. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
D. Downspout Boots: Steel.
E. Seal metal joints.

2.05 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. 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. Secure gutters and downspouts in place with concealed fasteners.

F. Connect downspouts to downspout boots, and seal connection watertight.
G. Set splash pads under downspouts.

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.

1.02 RELATED REQUIREMENTS

A. Section 053100 - Steel Decking.

1.03 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.

1.04 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.

1.05 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.

1.06 ROOF HATCHES

A. Roof Hatch Manufacturers:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Babcock-Davis: www.babcockdavis.com/#sle.
   3. Bilco Company: www.bilco.com/#sle.
   4. Milcor, Inc: www.milcorinc.com/#sle.
B. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
   1. Posts and Rails: Aluminum tube.
   2. Gate: Same material as railing; automatic closing with latch.
   3. Finish: Manufacturer's standard, factory applied finish.
   4. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
   5. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
   6. Fasteners: Stainless steel, Type 316.
   7. Manufacturers:
      a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

2.01 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.

2.02 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.

2.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

2.04 CLEANING

A. Clean installed work to like-new condition.

2.05 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.
B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
D. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.
E. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).
F. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.
G. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc.: www.adfire.com.
   2. 3M Fire Protection Products: www.3m.com/firestop.
   3. Hilti, Inc: www.us.hilti.com/#sle.
   4. Nelson FireStop Products: www.nelsonfirestop.com.
   5. Specified Technologies, Inc.: www.stifirestop.com.
B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
C. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Gypsum Board Walls:
    1. Wall to Wall Joints That Have Movement Capabilities (Dynamic):
        a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.04 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
    1. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
B. Penetrations By:
    1. Multiple Penetrations in Large Openings:
        a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
        b. 1 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
    2. Uninsulated Metallic Pipe, Conduit, and Tubing:
        a. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
        a. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    4. Electrical Cables Not In Conduit:
        a. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
    5. Insulated Pipes:
        a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.05 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
    1. Fire Ratings: See drawings for required systems and ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precompressed foam sealers.

1.02 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants 2017.
B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.
C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
E. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating sealant chemical characteristics.
C. Samples: Submit two samples, 1/2 x 1/2 inch in size illustrating sealant colors for selection.
D. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 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. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gunnable and Pourable Sealants:
   1. Adhesives Technology Corporation: www.atc.ws.
   2. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   3. Bostik Inc: www.bostik-us.com.
   4. ARDEX Engineered Cements: www.ardexamericas.com.
   5. Dow Corning Corporation: www.dowcorning.com.
   6. Hilti, Inc: www.us.hilti.com.
   7. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
   8. Pecora Corporation: www.pecora.com.
   9. The QUIKRETE Companies: www.quikrete.com.
   10. Red Devil: www.reddevil.com.
   11. Tremco Global Sealants: www.tremcosealants.com.
   12. Sherwin-Williams Company: www.sherwin-williams.com.
   13. Sika Corporation: www.usa-sika.com.
   14. W.R. Meadows, Inc: www.wrmeadows.com.
   15. Substitutions: See Section 016000 - Product Requirements.

B. Preformed Compressible Foam Sealers:
   1. EMSEAL Joint Systems, Ltd: www.emseal.com.
   2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
   3. Dayton Superior Corporation: www.daytonsuperior.com.
   4. Tremco Global Sealants: www.tremcosealants.com.

5. Substitutions: See Section 016000 - Product Requirements.

2.02 SEALANTS

A. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.

B. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Concealed sealant bead in siding overlaps.

C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: To be selected by Architect from manufacturer's full range.
   2. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

D. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
   2. Products:
      a. Bostik Inc: www.bostik-us.com.
      b. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
      c. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.
      d. Tremco Global Sealants; [____]: www.tremcosealants.com.
      e. Substitutions: See Section 016000 - Product Requirements.

E. Acoustical Sealant for Concealed Locations:
   1. Composition: Acrylic latex emulsion sealant.
   2. Applications: Use for concealed locations only:
      a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
   3. Products:
      a. Bostik Inc: www.bostik-us.com.
      b. Pecora Corporation; AIS-919 Acoustical and Insulation Latex Sealant: www.pecora.com.
      c. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
      d. Tremco Global Sealants: www.tremcosealants.com.
      e. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com.
      f. Substitutions: See Section 016000 - Product Requirements.

F. Polyurea Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Composition: Single or multi-part,100 percent solids by weight.
   2. Hardness: 75, minimum, after 7 days, when tested in accordance with ASTM D2240 Shore A.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Perform acoustical sealant application work in accordance with ASTM C919.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
G. Tool joints concave.
H. Concrete Floor Joint Filler: Install concrete floor joint filler per manufacturer's written instructions. After floor joint filler is fully cured, shave joint filler flush with top of concrete slab.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 079513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor and wall surfaces.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Placement of joint cover assembly frames in masonry.
B. Section 079200 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles 2020.
D. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
E. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.
E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
    1. Architectural Art Mfg, Inc: www.archart.com/#sle.
    2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
    3. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
    4. Inpro: www.inprocorp.com/#sle.
    5. MM Systems Corp: www.mmsystemscorp.com/#sle.
    6. Nystrom, Inc: www.nystrom.com/#sle.
    7. Pecora Corporation: www.pecora.com/#sle.
    8. Watson Bowman Acme Corporation: www.watsonbowmanacme.com/#sle.
    9. Substitutions: See Section 016000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Thermal Movement:
    1. Manufacturers:
        a. Balco, Inc; No-Bump Floor to Floor System, Aluminum (NBAF): www.balcousa.com/#sle.

b. Construction Specialties, Inc; Allway Standard Metal Floor Covers: www.c-sgroup.com/#sle.
c. Watson Bowman Acme Corporation; Wabo CorridorWrap Floor: www.watsonbowmanacme.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

B. Interior Wall/Ceiling Joints Subject to Thermal Movement:
1. Manufacturers:
a. Balco, Inc; Wall and Ceiling Snap-On Joint Cover (WD): www.balcousa.com/#sle.
b. Construction Specialties, Inc; Allway Standard Wall and Ceiling Covers: www.c-sgroup.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

C. Interior Fire-Rated Wall/Ceiling/Floor Joints Subject to Thermal Movement:
1. Manufacturers:
a. Construction Specialties, Inc; Fire Barriers: www.c-sgroup.com/#sle.

D. Interior/Exterior Fire-Rated Wall Joints Subject to Thermal Movement:
1. Manufacturers:
a. EMSEAL Joint Systems, Ltd; Emshield WFR2 System: www.emseal.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

E. Exterior Wall Joints Subject to Thermal Movement:
1. Manufacturers:
a. Balco, Inc; Exterior Wall, Elastomeric Face Seal System (FCWW): www.balcousa.com/#sle.
b. Construction Specialties, Inc; Exterior Wall Covers: www.c-sgroup.com/#sle.
c. EMSEAL Joint Systems, Ltd; BG System: www.emseal.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
1. Joint Dimensions and Configurations: As indicated on drawings.
2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
1. If floor covering is not indicated, obtain instructions from Architect before proceeding.
2. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.

C. Covers in Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
1. Exposed Finish Outdoors: Natural anodized.
2. Exposed Finish at Floors: Mill finish or natural anodized.
3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Anchors and Fasteners: As recommended by cover manufacturer.
C. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

2.05 ACCESSORIES

A. Resilient Fire Barrier: For use with metal expansion joint covers and elastomeric seals without use of mechanical fasteners, with fire rating in accordance with surrounding construction

performance capabilities.

1. Application: Roof.
2. Fire Resistance Rating: 3-hour, in accordance with ASTM E1966 and UL 2079.
3. Joint Opening: 3/8 inch, nominal.
4. Manufacturers:
    a. Balco, Inc; Expansion Joint Fire Barrier, Floor/Roof - MetaBlock, 2 Hour (MBF2H): www.balcousa.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.
B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.
B. Align work plumb and level, flush with adjacent surfaces.
C. Rigidly anchor to substrate to prevent misalignment.

END OF SECTION

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. Fire-rated hollow metal doors and frames.
D. Thermally insulated hollow metal doors with frames.
E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.
B. Section 088000 - Glazing: Glass for doors and borrowed lites.

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 A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.
D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
G. 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 2021a.
H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
I. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.
J. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
K. 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.

1.05 QUALITY ASSURANCE

A. 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. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. De La Fontaine Inc: www.delafontaine.com/#sle.
   3. De La Fontaine Inc: www.delafontaine.com.
   4. De La Fontaine Inc: www.delafontaine.com.
   5. Republic Doors: www.republicdoor.com.
   6. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   7. 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. 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. 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.

B. 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. 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.

C. Exterior Door Frames: Full profile/continuously welded type.

1. Weatherstripping: Separate, see Section 087100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
F. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.
G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 FINISHES

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

2.06 ACCESSORIES

A. Glazing: As specified in Section 088000, factory installed.
B. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
C. 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.
D. 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. 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.

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; fire 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 2018.
B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

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.

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: Red 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. Sheen: Flat.

B. Factory finish doors in accordance with sample to be provided.

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.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products Current Edition.
B. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 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.
C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Fire Rated Walls: See drawings for wall fire ratings.
   1. Location: As indicated on drawings.
   2. Wall Fire-Rating: As indicated on drawings.
   3. Panel Material: Steel.
   4. Size: 24 by 48 inch, unless otherwise indicated.
   5. Door/Panel: Uninsulated single-surface panel, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING UNITS

A. Manufacturers: Basis of Design: Acudor FB-5060-DW
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Babcock-Davis: www.babcockdavis.com/#sle.
   3. Bauco Access Panel Solutions Inc: www.accesspanelsolutions.com/#sle.
   4. Cendrex, Inc: www.cendrex.com/#sle.
   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. Style: Recessed door panel for infill with wall/ceiling finish.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames: 16 gage, 0.0598 inch, minimum thickness.
   4. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly that access doors are being installed.
      a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
   5. Steel Finish: Primed.
   6. Size: As indicated on the drawings.
   7. 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.

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. Fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough openings.

1.03 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

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: Submit two slats, 4 inches long illustrating shape, color and finish texture.
E. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Fire Doors: Basis of Design: Overhead Door Company
   1. Alpine Overhead Doors, Inc: www.alpinedoors.com/#sle.
   2. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   3. Raynor Garage Doors: www.raynor.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Doors, Fire-Rated: Galvanized steel slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Fire Rating: 1 hour; comply with NFPA 80.
   3. Nominal Slat Size: 1-1/4 inches wide.
   4. Slat Profile: Flat.
   5. Finish, Galvanized Steel: Factory baked enamel.
   6. Color: As selected by Architect from manufacturer's full colors.
   7. Guides: Formed track; same material and finish unless otherwise indicated.
   8. Hood Enclosure: Manufacturer's standard; primed steel.
   9. Coiling Door Release Mechanism: Fusible link activated with automatically governed closing speed.
   10. Manual hand chain lift operation.
   11. Locking Devices: Lock and latch handle on outside.

2.03 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with tube to provide reinforcement and positive contact in closed position.
   3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 16 gage, 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:
E. Latchset Lock Cylinders: Standard mortise cylinder type; keyed differently.
   1. Keying: Differently.
F. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
G. Latch Handle: Manufacturer's standard.
H. 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.
B. Install fire-rated doors in accordance with NFPA 80.
C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
F. Complete wiring from fire alarm system .
G. Install perimeter trim as indicated.

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 083323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors, operating hardware, interior, manual operation.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
B. Section 284600 - Fire Detection and Alarm: Fire alarm interconnection.

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 2017.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide general construction, electrical equipment, and component connections and details.
C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
D. Samples: Submit two slats, 2 by 6 inches in size illustrating shape, color and finish texture.
E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
F. Manufacturer's Qualification Statement.
G. Installer's Qualification Statement.
H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Provide five year manufacturer limited warranty for three-ply multifilament polyester fabric curtain.
C. Provide lifetime manufacturer limited warranty for counterweights and tension springs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors: Basis of Design Overhead Door Model 626
    1. Alpine Overhead Doors, Inc.: www.alpinedoors.com/#sle.
    2. C.H.I. Overhead Doors: www.chiohd.com/#sle.
    3. Clopay Corporation: www.clopaydoor.com/#sle.
    4. Cornell Iron Works, Inc.: www.cornelliron.com/#sle.
    5. The Cookson Company: www.cooksondoor.com/#sle.
    6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
    7. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING DOORS

A. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.
    1. Basis of Design: CHI 6201
        a. Single thickness slats.
        b. Nominal Slat Size: 2 1/2 inches wide x required length.
        c. Finish: Factory painted, color as selected.
        d. Guides, Angles: Galvanized steel.

e. Hood Enclosure: Manufacturer's standard; primed steel.
f. Manual hand crank lift operation.
g. Mounting: Within framed opening.
h. Locking Devices: Slide bolt on inside.

2.03 MATERIALS

A. Curtain Construction: Interlocking 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 angles to provide reinforcement and positive contact in closed position.
3. Curtain Bottom for Panel-Slat Curtains: Extruded aluminum.

B. Steel Slats: Minimum thickness, 22 gage, .025 inch; ASTM A653/A653M galvanized steel sheet.

C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.

D. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

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. Install enclosure and perimeter trim.

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 feet 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 2022.
C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
E. ASTM 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 1 - Motors and Generators 2021.
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: Basis of Design: Thermacore 592 by Overhead Door Corp.
   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.

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.

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 087100 - Door Hardware: Hardware items other than specified in this section.
B. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.
C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
I. 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).
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 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

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.
D. Samples: Submit one samples 12 x 12 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
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.

PART 2 PRODUCTS

2.01 MANUFACTURERS
2.02 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors:
   1. CMI Architectural Products: www.cmiarch.com.
   2. Kawneer North America: www.kawneer.com.
   3. Manko Window Systems, Inc: www.mankowindows.com.
   4. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   5. Tubelite, Inc: www.tubeliteinc.com.
   6. 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. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   3. Finish Color: Dark bronze.
   4. 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.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. 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.

7. 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.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

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. Design Wind Loads: Comply with requirements of ASCE 7.
b. 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 8 psf.
3. 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.

2.04 COMPONENTS

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.

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 Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored 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, retracting, 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. 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 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 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
B. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure 2017.
C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
I. 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 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 12 by 12 inches in size illustrating finished aluminum surface, glazing, and glazing materials.
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. Designer's Qualification Statement.
H. Manufacturer's Qualification Statement.
I. Installer's Qualification Statement.
J. 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 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 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. CMI Architectural Products: www.cmiarch.com.
    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. Fabrication Method: Either shop/factory or field fabricated system.
    2. Glazing Method: Either shop/factory or field glazed system.
    3. Vertical Mullion Dimensions: 2-1/2 inches wide by 7-1/2 inches deep.
    4. Finish: Class I color 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.
    5. 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.
    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. 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.

9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
10. 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.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).
B. Sheet Aluminum: ASTM B209 (ASTM B209M).
C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.
D. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.
E. Firestopping: As specified in Section 078400.
F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.
G. Glazing Accessories: As specified in Section 088000.
H. 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 Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
B. Color: To be selected by Architect from manufacturer's full range.
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 flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. 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 ADJUSTING

A. Adjust operating 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, 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.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

SECTION 085113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with operating sash.

B. Factory glazing.

C. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough opening framing.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.

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 E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation 2022.

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: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, and installation requirements.

D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Windows Manufacturers:
   1. DeSCo Architectural Windows.
   2. CMI Architectural Products, Inc.
   3. Manko Window Systems, Inc: www.mankowindows.com/#sle.
   4. Wausau Window and Wall Systems: www.wausauwindow.com/#sle.

2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   5. 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.

B. Horizontal Sliding Type:
   1. Construction: Non-thermally broken.
   2. Glazing: Single; clear; transparent.
   3. Exterior Finish: Class I color anodized.
   4. Interior Finish: Class I color anodized.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.04 HARDWARE

A. Pulls: Manufacturer's standard type.

B. Limit Stops: Resilient rubber.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42, integrally colored anodic coating not less than 0.7 mil thick.

PART 3 EXECUTION

3.01 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Install operating hardware not pre-installed by manufacturer.

3.02 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.03 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.04 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 CONDITIONS

A. Conditions of the contract (General and Supplementary Conditions) and Division 01 - General Requirements, govern the work of this section.

B. This section includes all material, and related service necessary to furnish all finish hardware indicated on the drawings or specified herein.

C. Furnish UL listed hardware for all labeled and 20 min. openings in conformance with the requirements for the class of opening scheduled. Underwriters' requirements shall have precedence over specification where conflicts exist.

D. All work shall be in accordance with all applicable state and local building codes. Code requirements shall have precedence over this specification where conflicts exist.

1.2 WORK INCLUDED

A. This section includes the following:

1. Furnish door hardware (for hollow metal, wood and aluminum doors) specified herein, listed in the hardware schedule, and/or required by the drawings.
2. Cylinders for Aluminum Doors
3. Thresholds and Weather-stripping (Aluminum frame seals to be provided by aluminum door supplier)
4. Electro-Mechanical Devices
5. Access Control components and or systems specified within this section.

B. Where items of hardware are not definitely or correctly specified and is required for the intended service, such omission, error or other discrepancy should be directed to the Architect prior to the bid date for clarification by addendum. Otherwise furnish such items in the type and quantity established by this specification for the appropriate service intended.

1.3 RELATED WORK IN OTHER SECTIONS

A. This section includes coordination with related work in the following sections:

1. Division 06 Section "Finish Carpentry".
2. Division 06 Section "Cabinet Hardware"
3. Division 08 Section "Hollow Metal Doors and Frames".
4. Division 08 Section "Wood Doors"
5. Division 08 Section "Aluminum Entrances and Storefronts"
6. Division 26 Sections “Electrical”
7. Division 28 Sections "Electronic Safety and Security".

1.4 REFERENCES

A. Publications of agencies and organizations listed below form a part of this specification section to the extent referenced.

1. DHI – Installation Guide for Doors and Hardware (2020).
2. NFPA 80 - Standards for Fire Doors and Windows.
3. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
4. UL - Building Material Directory.
5. DHI - Door and Hardware Institute
6. WHI - Warnock Hersey
7. BHMA - Builders Hardware Manufacturers Association
8. ANSI – American National Standards Institute
9. IBC - International Building Code 2018 Edition (as adopted and amended by local building code)

1.5 SUBMITTALS

A. Within ten days after award of contract, submit detailed hardware schedule in quantities as required by Division 01 - General Requirements.

B. Schedule format shall be consistent with recommendations for a vertical format as set forth in the Door & Hardware Institute's (DHI) publication "Sequence and Format for the Hardware Schedule". Hardware sets shall be consolidated to group multiple door openings which share similar hardware requirements. Schedule shall include the following information:

1. Door number, location, size, handing, and rating.
2. Door and frame material, handing.
3. Degree of swing.
4. Manufacturer
5. Product name and catalog number
6. Function, type and style
7. Size and finish of each item
8. Mounting heights
9. Explanation of abbreviations, symbols, etc.
10. Numerical door index, indicating the hardware set/ group number for each door.

C. When universal type door closers are to be provided, the schedule shall indicate the application method to be used for installation at each door: (regular arm, parallel arm, or top jamb).

D. The schedule will be prepared under the direct supervision of a certified Architectural Hardware Consultant (AHC), or certified Door Hardware Consultant (DHC) employed by the hardware distributor. The hardware schedule shall be signed and embossed or stamped with the DHI certification seal of the supervising AHC or DHC. The supervising AHC or DHC shall attend any meetings related to the project when requested by the architect.

E. Check the specified hardware for suitability and adaptability to the details and surrounding conditions.

F. Review drawings from related trades as required to verify compatibility with specified hardware. Indicate unsuitable or in compatible items, and proposed substitutions in the hardware schedule.

G. Provide documentation for all hardware to be furnished on labeled fire doors indicating compliance with positive pressure fire testing UL 10C.

H. Furnish manufacturers' catalog data for each item of hardware in quantities as required by Division 01 - General Requirements.

I. Submit a sample of each type of hardware requested by the architect. Samples shall be of the same finish, style, and function as specified herein. Tag each sample with its permanent location so that it may be used in the final work.

J. Furnish with first submittal, a list of required lead times for all hardware items.

K. After final approved schedule is returned, transmit corrected copies for distribution and field use in quantities as required by Division 01 - General Requirements.

L. Furnish approved hardware schedules, template lists, and pertinent templates as requested by related trades.

M. Furnish necessary diagrams, schematics, voltage and amperage requirements for all electro-mechanical devices or systems as required by related trades. Wiring diagrams shall be opening specific and include both a riser diagram and point to point diagram showing all wiring terminations.

N. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the owner’s representative to determine keying requirements. Upon completion of initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the door and hardware institute’s publication “Keying Procedures, Systems, and Nomenclature”. Submit copies of owner approved key schedule for review and

field use in quantities as required by Division 01 - General Requirements. Wiring diagrams shall be included in final submittals transmitted for distribution of field use.

1.6 QUALITY ASSURANCE

A. Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items by approved manufacturers that are equal in design, function, and quality, may be considered for prior approval of the architect, provided the required data and physical samples are submitted for approval as set forth in Division 01 - General Requirements.

B. Where indicated in this specification, products shall be independently certified by ANSI for compliance with relevant ANSI/BHMA standards A156.1 - A156.36 – Standards for Hardware and Specialties. All products shall meet or exceed certification requirements for the respective grade indicated within this specification. Supplier shall provide evidence of certification when requested by the architect.

C. Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. Electrical drawings and electrical specifications are based on the specific electrified hardware components specified in hardware sets. When electronic hardware components other than those indicated in hardware sets are provided, the supplier shall be responsible for all costs incurred by the design team and their consultants to review and revise electrical drawings and electrical specifications. Supplier shall also be responsible for any additional costs associated with required changes in related equipment, materials, installation, or final hook up to ensure the system will operate and function as indicated in the construction documents, including hardware set operational / functional descriptions.

E. All hardware items shall be manufactured no earlier than 6 months prior to delivery to site.

F. Hardware supplier shall be factory trained and certified by the manufacture to provide and support all computer managed locks and system components.

G. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years' experience in successful completion of projects similar in size and scope.

H. Provide hardware for all labeled fire doors, which complies with positive pressure fire testing UL 10C.

I. Comply with all applicable provisions of the standards referenced within section 1.4 of this specification.

J. Hardware supplier shall participate when reasonably requested to meet with the contractor and or architect to inspect any claim for incorrect or non-functioning materials; following such inspection, the hardware supplier shall provide a written statement documenting the cause and proposed remedy of any unresolved items.

1.7 DELIVERY, STORAGE AND HANDLING

A. Hardware supplier shall deliver hardware to the job site unless otherwise specified.

B. All hardware shall be delivered in manufacturers' original cartons and shall be clearly marked with set and door number.

C. Coordinate with contractor prior to hardware delivery and recommend secure storage and protection against loss and damage at job site.

D. Contractor shall receive all hardware and provide secure and proper protection of all hardware items to avoid delays caused by lost or damaged hardware. Contractor shall report shortages to the Architect and hardware supplier immediately after receipt of material at the job site.

E. Coordinate with related trades under the direction of the contractor for delivery of hardware items necessary for factory installation.

1.8 PRE-INSTALLATION MEETING

A. Schedule a hardware pre-installation meeting on site to review and discuss required door operating clearances and the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.

B. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.

C. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.9 WARRANTY

A. All hardware items shall be warranted against defects in material and workmanship as set forth in Division 01 - General Requirements.

B. Repair, replace, or otherwise correct deficient materials and workmanship without additional cost to owner.

PART 2 - PRODUCTS

2.1 FASTENERS

A. All exposed fasteners shall be Phillips head or as otherwise specified and shall match the finish of the adjacent hardware. All fasteners ex-posed to the weather shall be non-ferrous or stainless steel. Furnish correct fasteners to accommodate surrounding conditions.

B. Coordinate required reinforcements for doors and frames. Seek approval of the architect prior to furnishing through-bolts. Furnish through-bolts as required for materials not readily reinforced.

2.2 BUTT HINGES

A. Acceptable manufacturers and respective catalog numbers:

	Ives	Stanley	Hager	McKinney
1. Standard Weight, Plain Bearing	5PB1	F179	****	T2714
2. Standard Weight, Ball Bearing	5BB1	BB179	BB1279	TB2714
3. Standard Weight, Ball Bearing, Non-Ferrous	5BB1	FBB191	BB1191	TB2314
4. Heavy Weight, Ball Bearing	5BB1HW	FBB168	BB1168	T4B3786
5. Heavy Weight, Ball Bearing, Non-Ferrous	5BB1HW	FBB199	BB1199	T4B3386

B. Hinges shall be independently certified by ANSI for compliance with ANSI A156.1 (2006). Hinges shall meet or exceed the following ANSI grade requirements as indicated below:

1. Standard Weight, Plain Bearing Hinges: Grade 3
2. Standard Weight, 2 Ball Bearing Hinges: Grade 2
3. Heavy Weight, 4 Ball Bearing Hinges: Grade 1

C. Unless otherwise specified, furnish the following hinge quantities for each door leaf.

1. 3 hinges for doors up to 90 inches.
2. 1 additional hinge for every 30 inches on doors over 90 inches.
3. 4 hinges for Dutch door applications.

D. Unless otherwise specified, top and bottom hinges shall be located as specified in Division 08 Section "Hollow Metal Doors and Frames". Intermediate hinges shall be located equidistant from others.

E. Unless otherwise specified, furnish hinge weight and type as follows:

1. Standard weight: plain bearing hinge 5PB1 or ball bearing hinge 5BB1 for interior openings through 36 inches wide without a door closer.

2. Standard weight: ball bearing hinge 5BB1 for interior opening over 36 through 40 inches wide without a door closer, and for interior openings through 40 inches wide with a door closer.
3. Heavyweight: 4 ball bearing hinge 5BB1HW for interior openings over 40 inches wide, and for all vestibule doors.
4. Heavyweight: 4 ball bearing hinge 5BB1HWss for exterior openings unless otherwise listed in groups.
5. Heavyweight: 4 ball bearing hinge 5BB1HWss 5” for all exterior doors or 4 ball bearing hinge 5BB1HW 5” for interior doors, that have an automatic operator.

F. At existing frames receiving new hinges, match existing hinge size and weight.

G. Unless otherwise specified, furnish hinges for exterior doors, fabricated from brass, bronze, or stainless steel. Unless otherwise specified, hinges for interior doors may be fabricated from steel.

H. Unless otherwise specified, furnish hinges in the following sizes:
1. 5" x 5" 2-1/4" thick doors
2. 4-1/2" x 4-1/2" 1-3/4" thick doors
3. 3-1/2" x 3-1/2" 1-3/8" thick doors

I. Furnish hinges with width to accommodate trim and allow for 180-degree swing.

J. Unless otherwise specified, furnish hinges with flat button tips with non-rising pins at interior doors, non-removable loose pins (NRP) at exterior, and out-swinging lockable interior doors.

K. Unless otherwise specified, furnish all hinges to template standards.

2.3 CONTINUOUS PIN AND BARREL HINGES

A. Acceptable manufacturers and respective catalog numbers:

	Ives	Markar	Stanley
1. Edge Mount Pin & Barrel Stainless Steel Continuous Hinge	700 Series	300 Series	650 Series

B. Hinges shall be independently certified by ANSI for compliance with ANSI A156.26, Grade 1 (2012).

C. Continuous hinges shall be full height pin and barrel type hinge providing full height door support up to 600 lbs. Edge mount (unless noted otherwise).

D. Construct hinges of heavy-duty 14-gauge material. The stainless internal pin shall have a diameter of 0.25 and the exterior barrel diameter of 0.438.

E. Hinge shall be non-handed with symmetrical template hole pattern and factory drilled. Hinge must accept a minimum of 21 fasteners on the door and 21 fasteners on the frame.

F. Each knuckle to be 2 inches, including split nylon bearing at each separation for quiet, smooth, self-lubricating operation.

G. Hinge to be able to carry Warnock Hersey Int. or UL for fire rated doors and frames up to 3 hours.

H. Provide machine screws for doors which have been reinforced to accept machine screws.

I. Note: Fire label for doors and frames should be placed on the header and top rail of fire rated doors and frames.

2.4 POWER TRANSFERS

A. Acceptable manufacturers and respective catalog numbers:

	Von Duprin	ASSA
1. Concealed Two Wire	EPT-2	CEPT-10
2. Concealed Ten Wire	EPT-10	CEPT-10

B. Door cords shall be armored cable with screw on caps.

C. Concealed power transfers shall be concealed in the door and frame when the door is closed.

D. Concealed power transfers shall have a steel tube to protect wires from being cut.

E. Concealed power transfers with spring tubes shall be rejected.

F. Concealed power transfers shall be supplied with a mud box to house all terminations.

2.5 FLUSH BOLTS AND DUST PROOF STRIKES

A. Acceptable manufacturers and respective catalog numbers:

	Ives	Door Controls	Hager
1. Dust Proof Strike	DP2	80	280X
2. Auto Flush Bolt (Metal Door)	FB31P	842	292D
3. Auto Flush Bolt (Wood Door)	FB41P	942	291D
4. Constant Latching Bolt (Metal Door)	FB51P	845	293D
5. Constant Latching Bolt (Wood Door)	FB61P	945	294D
6. Manual Flush Bolt	FB458	780	282D

B. Unless otherwise specified, provide 12" rods for manual flush bolts for door 7'6" or less, 24" top rods for doors over 7'6" to 8'6".

C. Unless otherwise specified, provide doors over 8'6" with automatic top bolts.

D. Provide automatic flush bolts where required to maintain fire door listing and or egress requirements on pairs of doors.

E. All flush-bolt applications shall be UL listed to be installed with top flush-bolt only. Provide auxiliary fire bolt as required for fire rated openings where less bottom bolt has been specified.

F. Provide all bottom flush bolts with non-locking dust proof strikes.

2.6 EXIT DEVICES

A. Acceptable manufacturers and respective catalog numbers:

	Von Duprin	Sargent	Detex
1. Wide Stile, Push Pad	99 Series	GL-43-80 Series	Advantex (Wide Stile)
2. Wide Stile, Electric Latch Retraction	QEL 99 Series	43-56-80 Series	Advante-ER x (Wide Stile)
3. Lever Trim	996 Series	740 ET	“D/DM” Trim
4. Pull Trim	990 Series	800 MAL	“C” Trim

A. Exit devices shall be independently certified by ANSI for compliance with ANSI A156.3, Grade 1 (2008).

B. Obtain exit devices from a single manufacturer, although several may be indicated as offering products complying with requirements.

C. All exit devices shall be equipped with a sound-dampening feature to reduce touch pad return noise.

D. Quiet Electric Latch Retraction shall be accomplished using a motor driven assembly, and shall incorporate the following features:

1. Motor shall retract both the push pad assembly and latchbolt.
2. Automatic calibration of latch throw and pull.
3. Built-in time delay.
4. On-board installation and troubleshooting diagnostics built into power supply and device.
5. Retry mode if device does not pull on the first try.

E. On full glass doors there shall be no exposed fasteners on the back of the mechanism visible through the glass.

F. All exit devices shall be provided with flush end caps to reduce potential damage from impact.

G. All exit devices shall be provided with dead-locking latch bolts to ensure security.

H. All exit devices shall be U.L. listed for accident hazard. Exit device for use on fire doors shall also be U.L. listed for fire exit hardware.

I. Provide optional strikes, special length rods, and adapter plates to accommodate door and frame conditions. Provide narrow style series devices in lieu of wide stile series devices where optional strikes will not accommodate door and frame conditions.

J. Coordinate with related trades to ensure adequate clearance and reinforcement is provided in doors and frames. Provide thru bolts as required.

K. Refer to hardware groups for exit device applications utilizing the option of: "less bottom rod and floor strike" (LBR)

L. All exit devices shall be provided with optional trim designs to match other lever and pull designs used on the project.

M. Provide glass bead kits as required to accommodate door conditions. Screws shall not be visible through full glass doors.

N. Where specified, provide compatible keyed mullions with cylinder for pairs of doors.

O. Provide Von Duprin #154 or equivalent mullion/frame stabilizers at the following application(s):
   1. Lockable exterior or vestibule paired openings with a fixed or removable hollow metal or aluminum mullion.
   2. Lockable exterior or vestibule single doors in aluminum frames.

P. Provide reinforced crossbars for all traditional style exit devices applied to doors over 36" wide.

2.7 LOCKS AND LATCHES

A. Acceptable manufacturers and respective catalog numbers:

	Schlage	No Substitution
1. Grade 1 Mortise	L Series 06A	
2. Grade 1 Cylindrical	ND Series RHO	
3. Small Case Mortise Deadbolt	L400 Series	

B. Bored locks shall be independently certified by ANSI for compliance with ANSI A156.2 (2011). Mortise locks shall be independently certified by ANSI for compliance with ANSI A156.13 (2012).

C. Minimize transmission of heat to lock trim. Provide temperature control modules (TCM) on all electrified locks when cataloged by the lock manufacturer.

D. Unless otherwise specified, all locks and latches to have:
   1. 2-3/4" Backset
   2. 1/2" minimum throw latchbolt
   3. 1" throw deadbolt
   4. ANSI A115.2 strikes

E. Provide guarded latch bolts for all locksets, and latch bolts with throw to maintain fire rating of both single and paired door assemblies.

F. Provide strike with lip length adequate to clear surrounding trim.

G. Provide wrought boxes for strikes at inactive doors, wood frames, and metal frames without integral mortar covers.

H. Provide Von Duprin #154 or equivalent mullion/frame stabilizers at the following application(s) unless provided with deadbolt:
   1. Lockable exterior or vestibule paired openings with a fixed or removable hollow metal or aluminum mullion.
   2. Lockable exterior or vestibule single doors in aluminum frames.

2.8 PULLS, PUSH BARS, PUSH/PULL PLATES

A. Acceptable manufacturers and respective catalog numbers:

	Burns	Hager	Ives
1. Straight Pull (1" dia., 10" CTC)	26C	4J	8103-0
2. Straight Pull (3/4” dia., 8” CTC)	25B	3G	8102-8
3. Offset Door Pull (1" dia., 10" CTC)	39C	12J	8190-0
4. Offset Pull (1” dia., 18” CTC Pull)	39G	23Q	8190-18
5. Pull / Push-Bar (1" dia., 10" CTC Pull)	422 x 26C	153	9103-0
6. Offset Pull / Push-Bar (1" dia., 10" CTC Pull)	422 x 39C	159	9190-0
7. Offset Pull / Push-Bar (1” dia., 18” CTC Pull)	422 x 39G	161	9190-18
8. Push Plate (.050 4"X 16")	54	30S 4 x 16	8200 4 x 16
9. Push Plate (.050 6"X 16")	56	30S 6 x 16	8200 6" X 16"

A. Adjust dimensions of push plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, push plates shall be factory drilled for cylinders or other mortised hardware. All push plates shall be beveled 4 sides and counter sunk.

B. Where possible, provide back-to-back, and concealed mounting for pulls and push bars. Push bar length shall be 3" less door width, or center of stile to center of stile for stile & rail or full glass doors.

2.9 COORDINATORS

A. Acceptable manufacturers and respective catalog numbers:

	Ives	Door Controls	Hager
1. Bar Coordinator	COR x FL	600 x Filler	297D x 297F
2. Mounting Bracket	MB Series	AB, C Series	297 Series

B. Provide coordinators at all pairs of doors having automatic flush bolts and closers on the inactive leaf, and for pairs of doors having vertical rod/mortise exit device combinations with overlapping astragals.

C. Provide appropriate filler bars, closer mounting brackets, carry bars, and special top latch preparations as required by adjacent hardware.

2.10 CLOSERS

A. Acceptable manufacturers and respective catalog numbers:

	LCN	Yale	Norton
1.	4050A / 4050A EDA	R4400 / PR4400	R7500 / PR7500

B. Door closers shall be independently certified by ANSI for compliance with ANSI A156.4, Grade 1 (2013).

C. Obtain door closers from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. Provide extra heavy-duty arm (EDA / HD) when closer is to be installed using parallel arm mounting.

E. Hardware supplier shall coordinate with related trades to ensure aluminum frame profiles will accommodate specified door closers.

F. Closers shall use aluminum cylinders.

G. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UL10C.

H. Unless otherwise specified, all door closers shall have full covers and separate adjusting valves for sweeps, latch, and backcheck.

I. Provide closers for all labeled doors. Provide closer series and type consistent with other closers for similar doors specified elsewhere on the project.

J. Provide closers with adjustable spring power. Size closers to ensure exterior and fire rated doors will consistently close and latch doors under existing conditions. Size all other door closers to allow for reduced opening force not to exceed 5 lbs.

K. Install closers on the room side of corridor doors, stair side of stairways and interior side of exterior doors.

L. Closers shall be furnished complete with all mounting brackets and cover plates as required by door and frame conditions, and by adjacent hardware.

M. Door closers shall be provided with a powder coat finish to provide superior protection against the effects of weathering. Powder coat finish shall successfully pass a 100-hour salt spray test.

2.11 LOW ENERGY ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Acceptable manufacturers and respective catalog numbers:

	LCN
1. Electro-Hydraulic Operator	4640

B. Low energy operators shall be independently certified by ANSI for compliance with ANSI A156.19 (2002).

C. Where low kinetic energy, as defined by ANSI/BHMA Standard A156.19, power operators are indicated for doors required to be accessible to the disabled, provide electrically powered operators complying with the ADA for opening force and time to close standards.

D. The closing action shall be controlled by modern type cast iron door closer cylinder filled with a flat viscosity fluid, stable from +120F to -30F that would require no seasonal adjustments. The closer shall have field adjustable spring power; have two independent closing speed adjustment valves, and hydraulic back-check.

E. Full closing force shall be provided when the power or assist cycle ends.

F. All power operator systems shall include the following features and functions:
   1. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
   2. The operator will be designed with an electronically controlled mechanical clutching mechanism to prevent damage to the operator if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
   3. All covers, mounting plates and arm systems shall be powder coated and successfully pass a minimum of 100 hours testing as outlined in ANSI/BHMA Standard A156.18.
   4. UL listed for use on labeled doors.
   5. All operators shall be non-handed with spring power over a range of at least four sizes; either 1 through 4 or 2 through 5.
   6. The power operator shall incorporate microprocessor controlled digital controls including factory default memory settings, on-board diagnostics, non-volatile memory, and integrated delay and relay for controlling door release devices.
   7. Provisions in the control box or module shall provide control {inputs and outputs) for; electric strike delay, auxiliary contacts, sequential operation, fire alarms systems, actuators, swing side sensors, and stop side sensors.
   8. Exterior switches shall be weather resistant and mount on a single gang electrical box furnished by Division 26.

G. All electrically powered operators shall include the following features or functions:
   1. When an obstruction or resistance to the opening swing is encountered, the operator will pause at that point, then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.

2. Easily accessible main power and maintain hold open switches will be provided on the operator.
3. An electronically controlled clutch to provide adjustable opening force.
4. A microprocessor to control all motor and clutch functions.
5. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0 ampere combined load.
6. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily replaceable without special tools or component replacement.
7. If electrical failure occurs, the unit shall operate as a standard door closer.

H. Power Operators shall be warranted by the manufacture to be free from defects in material and workmanship for a period of two years.

2.12 KICK PLATES AND MOP PLATES

A. Furnish protective plates as specified in hardware groups.

B. Where specified, provide 10" kick plates, 34" armor plates, and 4" mop plates. Unless otherwise specified, metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.

C. Protective plates shall be 2" less door width, or 1" less door width at pairs. All protective plates shall be beveled 4 sides and counter sunk.

D. Protection plates over 16" shall not be provided for labeled doors unless specifically approved by door manufacturers listing. When protection plates over 16” are provided for labeled doors, the plate shall be labeled.

E. Where specified, provide surface mounted door edges. Edges shall butt to protective plates. Provide edges with cutouts as required adjacent hardware.

F. Adjust dimensions of protection plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware.

2.13 OVERHEAD STOPS

A. Acceptable manufacturers and respective catalog numbers:

	Glynn-Johnson	Rixson	Sargent
1. Heavy Duty Surface Mount	GJ900 Series	9 Series	590
2. Heavy Duty Concealed Mount	GJ100 Series	1 Series	690

B. Unless otherwise specified, furnish GJ900 series overhead stop for hollow metal or 1-3/4” solid core doors equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall, for hollow metal or 1-3/4” solid core doors that open against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate, and as specified in hardware groups.

C. Furnish sex bolt attachments for wood and mineral core doors unless doors are supplied with proper reinforcing blocks.

D. Do not provide holder function for labeled doors.

2.14 WALL STOPS AND HOLDERS

A. Acceptable manufacturers and respective catalog numbers:

	Ives	Hager	Burns
1. Wrought Convex Wall Stop	WS406CVX	232W	570
2. Wrought Concave Wall Stop	WS406CCV	236W	575
3. Automatic Wall Holder	WS40	326W	533

B. Furnish a stop or holder for all doors.

C. Provide concave style wall stop at all adjacent integral push button locks; provide convex style wall stop at all other locations.

D. Where wall stops are not applicable, furnish overhead stops.

E. Furnish floor stops or hinge pin stops only where specified in hardware sets.

F. Do not provide holder function for labeled doors.

2.15 MAGNETIC HOLD OPENS

A. Acceptable manufacturers and respective catalog numbers:

	LCN	ABH	Edwards
1. Wall Holder	SEM 7800	2000	1500

B. Magnetic hold opens shall be independently certified by ANSI for compliance with ANSI A156.15, Grade 1 (2006).

C. Magnetic holder's housing and armature shall be constructed of a die cast zinc material.

D. Provide types as listed in groups.

E. Where wall conditions do not permit the armature to reach the magnet, provide extensions.

F. Provide proper voltage and power consumption as required by Division 16.

G. Coordinate electrical requirements and mounting locations with other trades.

2.16 WEATHERSTRIP, GASKETING

A. Acceptable manufacturers and respective catalog numbers:

	Zero	Pemko	NGP	Reese
1. Weatherstrip	429	2891_PK	700NA	755
2. Adhesive Gasket	188	S88	5050	797
3. Meeting Edge Seals	8193	18041	9605	959
4. Sweep (Brush)	8192	18061_NB	B606	964
5. Sweep w/ drip	8198	345_N	C627	354
6. Drip Cap	142	346	16	R201

B. Weatherstrip and gasketing shall be independently certified by ANSI for compliance with ANSI A156.22 (2005).

C. Where specified in the hardware groups, furnish the above products unless otherwise detailed in groups.

D. Provide weatherstripping all exterior doors and where specified.

E. Provide intumescent and other required edge sealing systems as required by individual fire door listings to comply with positive pressure standards UL 10C.

F. Provide Zero 188 smoke gaskets at all fire rated doors and smoke and draft control assemblies.

G. Provide gasketing for all meeting edges on pairs of fire doors. Gasketing shall be compatible with astragal design provided by door supplier as required for specific fire door listings.

2.17 SOUND SEALS

A. Acceptable manufacturers and respective catalog numbers:

	Zero	Pemko	NGP	Reese
1. Perimeter Sound Seals (used with Cylindrical Lock & Exit Devices)	485A	316AV	152V	788A
2. Automatic Door Bottom (HD Concealed) (When Sealing Against A Solid Surface)	360	434_RL	423N	430
3. Automatic Door Bottom (HD Concealed) (When Sealing Against Carpet)	360	434_NBL	683	943

A. Weatherstrip and gasketing shall be independently certified by ANSI for compliance with ANSI A156.22 (2012).

B. Where specified in the hardware groups, furnish the above products unless otherwise detailed in groups.

C. Provide intumescent and other required edge sealing systems as required by individual fire door listings to comply with positive pressure standards UL 10C.

2.18 THRESHOLDS

A. Acceptable manufacturers and respective catalog numbers:

	Zero	Pemko	NGP	Reese
1. Saddle Thresholds	8655	171	425	S205
2. Half Saddle Thresholds	1674	227	324	S239
3. Interlocking Threshold	74A	114	442-5	T550
4. ¼" Saddle Thresholds	63	151	411	S263

A. Thresholds shall be independently certified by ANSI for compliance with ANSI A156.21 (2001).

B. Hardware supplier shall verify all finish floor conditions and coordinate proper threshold as required to ensure a smooth transition between threshold and interior floor finish.

C. Threshold Types:

1. Unless otherwise specified, provide saddle threshold similar to Zero 8655 for all exterior openings with an interior floor finish less than or equal to 1/4" in height.
2. Unless otherwise specified, provide half saddle threshold similar to Zero 1674 for all exterior openings with an interior floor finish greater than 1/4" in height. Threshold height shall match thickness of interior floor finish.

2.19 ELECTRIC STRIKES

A. Acceptable manufacturers and respective catalog numbers:

	Von Duprin	Hes
1. Type 1	6200 Series	4500C Series
2. Type 1	6100 Series	*****
3. Type 1	6300 Series	9500 Series

B. Provide electric strikes compatible with the type of locks shown at each opening where specified.

C. Electric strikes shall be UL listed as Burglary-Resistant Electric Door Strikes and where required shall be UL listed as Electric Strike for Fire Doors.

D. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.20 FINISHES AND BASE MATERIALS

A. Unless otherwise indicated in the hardware groups or herein, hardware finishes shall be applied over base metals as specified in the following finish schedule:

HARDWARE ITEM	BHMA FINISH AND BASE MATERIAL
1. Butt Hinges: Exterior, or Non-Ferrous	630 (US32D - Satin Stainless Steel)
2. Butt Hinges: Interior	652 (US26D - Satin Chromium)
3. Continuous Hinges	630 (US32D - Satin Stainless Steel)
4. Flush Bolts	626 (US26D - Satin Chromium)
5. Exit Devices	626 (US26D - Satin Chromium)
6. Locks and Latches	626 (US26D - Satin Chromium)
7. Pulls and Push Plates/Bars	630 (US32D - Satin Stainless Steel)
8. Coordinators	600 (Prime painted or mill alum.)
9. Closers	689 (Powder Coat Aluminum)
10. Protective Plates	630 (US32D - Satin Stainless Steel)
11. Overhead Stops	630 (US32D - Satin Stainless Steel)
12. Wall Stops and Holders	630 (US32D - Satin Stainless Steel)
13. Thresholds	719 (Mill Aluminum)
14. Weather-strip, Sweeps Drip Caps (wood and	Aluminum Anodized

hollow metal doors)

15.	Weather-strip, Sweeps Drip Caps (aluminum doors)	Match finish of aluminum doors.
16.	Magnetic Holders	689 (Powder Coat Aluminum)
17.	Miscellaneous	626 (US26D - Satin Chromium)

2.21 KEYING

A. Provide all cylinders in keyways as required to accommodate owners existing key system.

B. Provide interchangeable cores for all locks and cylinders if required by the Owner.

C. All locks under this section shall be keyed as directed by the owner to an existing Master Key System.

D. Furnish a total of 2 keys per cylinder. Actual cut keys to be determined by owner.

E. Master keys, control keys, and change keys shall be delivered by registered mail to the owner. Construction keys shall be delivered to the contractor.

2.22 KEY CABINETS

A. Acceptable manufacturers and respective catalog numbers:

	Lund	Key Control	Telkee
1.	1200-1205 AA	M228-2480	RWC-AWC

B. Furnish 1 each model 1200 or 1205 AA key cabinet with a capacity 1.5 times the number of key sets.

C. Provide one key cabinet with at least one hook for each key set, plus additional hooks for 50% expansion.

D. Furnish key cabinet complete with cam lock, permanent key tags, and change key cards.

E. Hardware supplier shall prepare all key change index records, tag all keys and place permanent file keys in cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, installer shall examine door frame installation to ensure frames have been set square and plumb. Installer shall examine doors, door frames, and adjacent wall, floor, and ceiling for conditions, which would adversely affect proper operation and function of door assemblies. Do not proceed with hardware installation until such deficiencies have been corrected.

3.2 INSTALLATION

A. Before hardware installation, general contractor/construction manager shall coordinate a hardware installation seminar with a 1 week notice to all parties involved. The seminar is to be conducted on the installation of hardware, specifically of locksets, closers, exit devices, continuous hinges and overhead stops. Manufacturer's representative of the above products to present seminar. Seminar to be held at the job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal and wood doors. Training to include use of installation manuals, hardware schedule, templates and physical products samples.

B. Shim doors as required to maintain proper operating clearance between door and frame.

C. Install all hardware in accordance with the approved hardware schedule and manufacturer’s instructions for installation and adjustment.

D. Set units level, plumb and true to the line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Provide blocking or reinforcement for all hardware mounted to drywall construction, including wall mounted door stops and holders.

F. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accord with industry standards.

G. Drill appropriate size pilot holes for all hardware attached to wood doors and frames.

H. Unless otherwise specified, locate all hardware in accordance with the recommended locations for builders hardware for standard doors and frames as published by the Door and Hardware Institute (TDH-007-20).

I. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.

J. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.

K. Conceal push and pull bar fasteners where possible. Do not install through bolts through push plates.

L. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain the label.

M. Apply self-adhesive gasketing on frame stop at head & latch side and on rabbet of frame at hinge side.

N. Install hardware in accordance with supplemental "S" label instructions on all fire rated openings.

O. Install wall stops to contact lever handles or pulls. Do not mount wall stops on casework, or equipment.

P. Where necessary, adjust doors and hardware as required to eliminate binding between strike and latchbolt. Doors should not rattle.

Q. Overhead stops used in conjunction with electrified hold open closers shall be templated and installed to coincide with engagement of closer hold open position.

R. Install door closers on corridor side of lobby doors, room side of corridor doors, and stair side of stairways.

S. Adjust spring power of door closers to the minimum force required to ensure exterior and fire rated doors will consistently close and latch doors under existing conditions. Adjust all other door closers to ensure opening force does not to exceed 5 lbs.

T. Adjust "sweep", "latch", & "back check" valves on all door closers to properly control door throughout the opening and closing cycle. Adjust total closing speed as required to comply with all applicable state and local building codes.

U. Install "hardware compatible" (bar stock) type weatherstripping continuously for an uninterrupted seal. Adjust templating for parallel arm door closers, exit devices, etc., as required to accommodate weatherstripping.

V. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside door face. Notch and closely fit thresholds to frame profile. Set thresholds in full bed of sealant.

W. Compress sweep during installation as recommended by sweep manufacturer to facilitate a water-resistant seal.

X. Deliver to the owner 1 complete set of installation and adjustment instructions, and tools as furnished with the hardware.

3.3 FIELD QUALITY CONTROL

A. After installation has been completed, the hardware supplier and manufacturers representative for locksets, door closers, exit devices, and overhead stops shall check the project and verify

compliance with installation instructions, adjustment of all hardware items, and proper application according to the approved hardware schedule. Hardware supplier shall submit a list of all hardware that has not been installed correctly.

B. After installation has been completed, the hardware supplier and manufacturers representative shall meet with the owner to explain the functions, uses, adjustment, and maintenance of each item of hardware. Hardware supplier shall provide the owner with a copy of all wiring diagrams. Wiring diagrams shall be opening specific and include both a riser diagram and point to point diagram showing all wiring terminations.

3.4 ADJUSTMENT AND CLEANING

A. At final completion, and when H.V.A.C. equipment is in operation, installer shall make final adjustments to and verify proper operation of all door closers and other items of hardware. Lubricate moving parts with type lubrication recommended by the manufacturer.

B. All hardware shall be left clean and in good operation. Hardware found to be disfigured, defective, or inoperative shall be repaired or replaced.

3.5 HARDWARE SCHEDULE

A. The following schedule of hardware groups are intended to describe opening function. The hardware supplier is cautioned to refer to the preamble of this specification for a complete description of all materials and services to be furnished under this section.

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HW SET: 01

2	EA	CONT. HINGE	700	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	VON
4		CYLINDER	AS REQUIRED	UNK
1	EA	PANIC HARDWARE	CD-99-EO	VON
1	EA	PANIC HARDWARE	CD-99-NL-OP	VON
1	EA	ELECTRIC STRIKE	6300 FSE	VON
2	EA	90 DEG OFFSET PULL	8190 10"	IVE
2	EA	OH STOP	100S	GLY
2	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	RAIN DRIP	142	ZER
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	
2	EA	DOOR SWEEP W/DRIP	8198	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER
1	EA	CARD READER/ACCESS CONTROL	BY SECURITY SUPPLIER	BYO
1	EA	POWER SUPPLY	BY SECURITY SUPPLIER	BYO
1	EA	ELEVATION DRAWING		
1	EA	WIRE DIAGRAM	POINT TO POINT	

FUNCTION: (NL) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD AND OUTSIDE BY KEY IN CYLINDER. DOOR LOCKS WHEN KEY IS REMOVED AND DOOR IS CLOSED. ACCESS FROM EXTERIOR WHEN EXIT DEVICE PUSH PAD IS DOGGED DOWN. PRESENTATION OF A VALID CREDENTIAL OR ACCESS CONTROL SYSTEM PROGRAMMING CONTROLS STRIKE.
FUNCTION: (EO) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD. ACCESS FROM EXTERIOR WHEN EXIT DEVICE PUSH PAD IS DOGGED DOWN.

HW SET: 02

2	EA	CONT. HINGE	700	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	VON
4		CYLINDER	AS REQUIRED	UNK
1	EA	PANIC HARDWARE	CD-99-EO	VON
1	EA	PANIC HARDWARE	CD-99-NL-OP	VON
1	EA	ELECTRIC STRIKE	6300 FSE	VON
2	EA	90 DEG OFFSET PULL	8190 10"	IVE
2	EA	OH STOP	100S	GLY
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	SURF. AUTO OPERATOR	4642	LCN
2	EA	ACTUATOR, JAMB MOUNT	8310-818	LCN
1	EA	RAIN DRIP	142	ZER
1	EA	WEATHERSTRIP	BY DR/FR SUPPLIER	
2	EA	DOOR SWEEP W/DRIP	8198	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER
1	EA	CARD READER/ACCESS CONTROL	BY SECURITY SUPPLIER	BYO
1	EA	POWER SUPPLY	BY SECURITY SUPPLIER	BYO
1	EA	ELEVATION DRAWING		
1	EA	WIRE DIAGRAM	POINT TO POINT	

FUNCTION: (NL) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD AND OUTSIDE BY KEY IN CYLINDER. DOOR LOCKS WHEN KEY IS REMOVED AND DOOR IS CLOSED. ACCESS FROM EXTERIOR WHEN EXIT DEVICE PUSH PAD IS DOGGED DOWN. PRESENTATION OF A VALID CREDENTIAL OR ACCESS CONTROL SYSTEM PROGRAMMING CONTROLS STRIKE.
FUNCTION: (EO) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD. ACCESS FROM EXTERIOR WHEN EXIT DEVICE PUSH PAD IS DOGGED DOWN.
OUTSIDE ACTUATOR IS CONTROLLED BY THE ACCESS CONTROL SYSTEM. INSIDE ACTUATOR IS ALWAYS ACTIVE TO MOMENTARILY ENERGIZE STRIKE THEN OPEN DOOR.

HW SET: 03

2	EA	CONT. HINGE	700	IVE
2	EA	PUSH/PULL BAR	9103 10"- 1" DIA	IVE
2	EA	OH STOP	100S	GLY
2	EA	SURFACE CLOSER	4050A EDA	LCN

HW SET: 04

2	EA	CONT. HINGE	700	IVE
2	EA	PUSH/PULL BAR	9103 10"- 1" DIA	IVE
2	EA	OH STOP	100S	GLY
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	SURF. AUTO OPERATOR	4642	LCN
2	EA	ACTUATOR, JAMB MOUNT	8310-818	LCN

HW SET: 05

	EA	HINGE	AS REQUIRED	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	MULLION STABILIZER	154	VON
1	EA	ELECTRIC STRIKE	6211 FSE	VON
1	EA	OH STOP	90S	GLY
1	EA	SURFACE CLOSER	4050A EDA ST-5204	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	RAIN DRIP	142	ZER
1	SET	WEATHERSTRIP	429	ZER
1	EA	DOOR SWEEP W/DRIP	8198	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER
1	EA	CARD READER/ACCESS CONTROL	BY SECURITY SUPPLIER	BYO
1	EA	POWER SUPPLY	BY SECURITY SUPPLIER	BYO
1	EA	ELEVATION DRAWING		
1	EA	WIRE DIAGRAM	POINT TO POINT	

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.PRESENTATION OF VALID CREDENTIAL MOMENTARILY ENERGIZES ELECTRIC STRIKE.

HW SET: 06

	EA	HINGE	AS REQUIRED	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	MULLION STABILIZER	154	VON
1	EA	OH STOP	90S	GLY
1	EA	SURFACE CLOSER	4050A EDA ST-5204	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	RAIN DRIP	142	ZER
1	SET	WEATHERSTRIP	429	ZER
1	EA	DOOR SWEEP W/DRIP	8198	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 07

	EA	HINGE	AS REQUIRED	IVE
1		CYLINDER	AS REQUIRED	UNK
1	EA	PANIC HARDWARE	LD-99-NL	VON
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE

FUNCTION: (NL) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD AND OUTSIDE BY KEY IN CYLINDER. DOOR LOCKS WHEN KEY IS REMOVED AND DOOR IS CLOSED.

HW SET: 08

	EA	HINGE	AS REQUIRED	IVE
1	EA	PASSAGE SET	ND10S	SCH
1	EA	SURFACE CLOSER	4050A SCUSH	LCN
1	EA	WALL STOP	WS406/407CCV	IVE
1	SET	WEATHERSTRIP	429	ZER
1	EA	DOOR SWEEP	8192	ZER
1	EA	THRESHOLD	PROFILE AS REQUIRED	ZER

FUNCTION: PASSAGE LATCH
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE AT ALL TIMES.

HW SET: 09

	EA	HINGE	AS REQUIRED	IVE
1	EA	PASSAGE SET	ND10S	SCH
1	EA	WALL STOP	WS406/407CCV	IVE
1	SET	GASKETING	485	ZER
1	EA	MORTISE DOOR BOTTOM	360	ZER

FUNCTION: PASSAGE LATCH
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE AT ALL TIMES.

HW SET: 10

	EA	HINGE	AS REQUIRED	IVE
1	EA	PASSAGE SET	ND10S	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7800	LCN
1	EA	GASKETING	188S	ZER

FUNCTION: PASSAGE LATCH
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE AT ALL TIMES.

HW SET: 11

	EA	HINGE	AS REQUIRED	IVE
1	EA	DOOR PULL, 1" ROUND	8103 10"	IVE
1	EA	PUSH PLATE	8200 6" X 16"	IVE
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

HW SET: 12

	EA	HINGE	AS REQUIRED	IVE
1	EA	CLASSROOM DEAD LOCK	L463	SCH
1	EA	DOOR PULL, 1" ROUND	8103 10"	IVE
1	EA	PUSH PLATE	8200 6" X 16"	IVE
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: L463 CLASSROOM DEAD LOCK
DEADBOLT THROWN OR RETRACTED BY KEY FROM OUTSIDE. INSIDE THUMBTURN CYLINDER RETRACTS DEADBOLT BUT CANNOT PROJECT IT.

HW SET: 13

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 14

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7800	LCN
1	EA	GASKETING	188S	ZER

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 15

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 16

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S	ZER

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 17

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	OH STOP	90S	GLY
1	EA	SURFACE CLOSER	4050A REG	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 18

	EA	HINGE	AS REQUIRED	IVE
1	EA	ENTRANCE LOCK	ND53	SCH
1	EA	OH STOP	90S	GLY
1	EA	SURFACE CLOSER	4050A HREG	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE

FUNCTION: OFFICE AND INNER ENTRY LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY TURNING INSIDE THUMBTURN. WHEN OUTSIDE IS LOCKED, LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER REMAINS LOCKED UNTIL THUMBTURN IS RETURNED TO VERTICAL OR UNLOCKED BY KEY. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 19

1	EA	HINGE	AS REQUIRED US32D	IVE
1	EA	OFFICE W/SIM RETRACT W/OCC IND	L9056N L283-722 XL13-439 (FULL ESCUTCHEON)	SCH
1	EA	SURFACE CLOSER	4050A SCUSH	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	GASKETING	188S	ZER

FUNCTION: OFFICE LOCK WITH AUTOMATIC UNLOCKING AND INDICATOR
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY ROTATING INSIDE THUMBTURN. OUTSIDE LEVER UNLOCKED BY KEY OUTSIDE OR THUMBTURN. ROTATING INSIDE LEVER SIMULTANEOUSLY RETRACTS LATCHBOLT AND UNLOCKS OUTSIDE LEVER. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.
OUTSIDE INDICATOR DISPLAYS OCCUPIED/VACANT.

HW SET: 20

	EA	HINGE	AS REQUIRED	IVE
1	EA	OFFICE W/SIM RETRACT W/OCC IND	L9056N L283-722 XL13-439 (FULL ESCUTCHEON)	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S	ZER

FUNCTION: OFFICE LOCK WITH AUTOMATIC UNLOCKING AND INDICATOR
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR BY ROTATING INSIDE THUMBTURN. OUTSIDE LEVER UNLOCKED BY KEY OUTSIDE OR THUMBTURN. ROTATING INSIDE LEVER SIMULTANEOUSLY RETRACTS LATCHBOLT AND UNLOCKS OUTSIDE LEVER. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.
OUTSIDE INDICATOR DISPLAYS OCCUPIED/VACANT.

HW SET: 21

	EA	HINGE	AS REQUIRED	IVE
1	EA	CLASSROOM LOCK	ND70	SCH
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: CLASSROOM LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS LOCKED BY KEY. UNLOCKED FROM OUTSIDE BY KEY. INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EXIT. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED..

HW SET: 22

	EA	HINGE	AS REQUIRED	IVE
1	EA	CLASSROOM LOCK	ND70	SCH
1	EA	OH STOP	90S	GLY

FUNCTION: CLASSROOM LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS LOCKED BY KEY. UNLOCKED FROM OUTSIDE BY KEY. INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EXIT. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 23

	EA	HINGE	AS REQUIRED	IVE
1	EA	CLASSROOM LOCK	ND70	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S	ZER

FUNCTION: CLASSROOM LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS LOCKED BY KEY. UNLOCKED FROM OUTSIDE BY KEY. INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EXIT. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 24

	EA	HINGE	AS REQUIRED	IVE
1	EA	MANUAL FLUSH BOLT	FB458	IVE
1	EA	CONST LATCHING BOLT	FB51T	IVE
1	EA	DUST PROOF STRIKE	DP2	IVE
1	EA	CLASSROOM LOCK	ND70	SCH
2	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: CLASSROOM LOCK
LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS LOCKED BY KEY. UNLOCKED FROM OUTSIDE BY KEY. INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EXIT. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 25

	EA	HINGE	AS REQUIRED	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 26

	EA	HINGE	AS REQUIRED	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 27

	EA	HINGE	AS REQUIRED	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	SURFACE CLOSER	4050A REG OR EDA AS REQ	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S	ZER

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 28

	EA	HINGE	AS REQUIRED	IVE
1	EA	CONST LATCHING BOLT	FB51T	IVE
1	EA	STOREROOM LOCK	ND80	SCH
1	EA	OH STOP & HOLDER	90H @ INACTIVE LEAF	GLY
1	EA	SURFACE CLOSER	4050A HEDA	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: STOREROOM LOCK
LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE. OUTSIDE LEVER ALWAYS INOPERATIVE. AUXILIARY LATCH DEADLOCKS LATCHBOLT WHEN DOOR IS CLOSED.

HW SET: 29

	EA	HINGE	AS REQUIRED	IVE
1		CYLINDER	AS REQUIRED	UNK
1		THUMBTURN CYLINDER	AS REQUIRED AT -2SI	UNK
1	EA	FIRE EXIT HARDWARE	99-L-F-2-2SI	VON
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7800	LCN
1	EA	GASKETING @ HEAD ONLY	429	ZER
2	EA	GASKETING @ JAMBS	485	ZER
1	EA	MORTISE DOOR BOTTOM	360	ZER

FUNCTION: (L-2SI) FREE EGRESS AT ALL TIMES. PRESSING PUSH BAR RETRACTS LATCHBOLTS. TRIM ALWAYS LOCKED, ENTRANCE BY TRIM WHEN KEY RETRACTS LATCHBOLT FROM PULL SIDE. INSIDE THUMBTURN CYLINDER LOCKS OR UNLOCKS THE OUTSIDE TRIM. WHEN LOCKED OUTSIDE KEY RETRACTS THE LATCHBOLT. INSIDE INDICATOR DISLAYS LOCKED/UNLOCKED.

HW SET: 30

	EA	HINGE	AS REQUIRED	IVE
2	EA	FIRE EXIT HARDWARE	9947WDC-EO-F-LBR-SNB	VON
2	EA	SURFACE CLOSER	4050A EDA	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800	LCN
1	EA	GASKETING	188S	ZER
2	EA	MEETING EDGE SEAL	8193	ZER

FUNCTION: (EO) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD. NO EXTERIOR TRIM.

HW SET: 31

	EA	HINGE	AS REQUIRED	IVE
1		CYLINDER	AS REQUIRED	UNK
1	EA	FIRE EXIT HARDWARE	9927-EO-F-LBR	VON
1	EA	FIRE EXIT HARDWARE	9927-L-F-LBR	VON
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	SURFACE CLOSER	4050A SCUSH	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S	ZER
2	EA	MEETING EDGE SEAL	8193	ZER

FUNCTION: (L) LATCHBOLT RETRACTED BY DEPRESSING THE ACTUATION BAR. ENTRANCE BY LEVER. KEY LOCKS OR UNLOCKS LEVER.
FUNCTION: (EO) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD.

HW SET: 32

	EA	HINGE	AS REQUIRED	IVE
1		CYLINDER	AS REQUIRED	UNK
1	EA	FIRE EXIT HARDWARE	9927-EO-F-LBR	VON
1	EA	FIRE EXIT HARDWARE	9927-L-F-LBR	VON
2	EA	SURFACE CLOSER	4050A EDA	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800	LCN
1	EA	GASKETING	188S	ZER
2	EA	MEETING EDGE SEAL	8193	ZER

FUNCTION: (L) LATCHBOLT RETRACTED BY DEPRESSING THE ACTUATION BAR. ENTRANCE BY LEVER. KEY LOCKS OR UNLOCKS LEVER.
FUNCTION: (EO) LATCHBOLT RETRACTED INSIDE BY EXIT DEVICE PUSH PAD.

HW SET: 33

	EA	HINGE	AS REQUIRED	IVE
2		CYLINDER	AS REQUIRED	UNK
1	EA	PANIC HARDWARE	CD-99-L	VON
1	EA	SURFACE CLOSER	4050A EDA	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE

FUNCTION: (L) LATCHBOLT RETRACTED BY DEPRESSING THE ACTUATION BAR. ENTRANCE BY LEVER. KEY LOCKS OR UNLOCKS LEVER. ACCESS FROM EXTERIOR WHEN EXIT DEVICE PUSH PAD IS DOGGED DOWN.

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.
B. Glazing units.
C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames: Glazed borrowed lites.
B. Section 081416 - Flush Wood Doors: Glazed lites in doors.
C. Section 084313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
C. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.
D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
E. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
F. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2019.
G. ITS (DIR) - Directory of Listed Products Current Edition.
H. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
I. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies 2022.
J. UL (DIR) - Online Certifications Directory Current Edition.
K. UL 9 - Standard for Fire Tests of Window Assemblies Current Edition, Including All Revisions.
L. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.
M. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
N. 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.

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 five (5) 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..
   6. Substitutions: Refer to Section 016000 - Product Requirements.

B. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Manufacturers:
   2. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
   3. Technical Glass Products: www.fireglass.com/#sle.
   4. Vetrotech North America: www.vetrotechusa.com/#sle.
   5. 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.

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 5.2/6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 5.2/6.3 computer program.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
   2. 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.
   2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   3. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   4. Spacer Color: Black.
   5. Edge Seal:
   6. Color: Black.
   7. Purge interpane space with dry air, hermetically sealed.

B. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   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. Visible Light Transmittance (VLT): 57 percent, nominal.
7. Solar Heat Gain Coefficient (SHGC): 25 percent, nominal.
8. Glazing Method: Dry glazing method, gasket glazing.

C. Type IG-3 - Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
b. Coating: Same as on vision units, on #2 surface.
4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
a. Opacifier: Elastomeric coating, on #4 surface.
b. Opacifier Color: To be selected from manufacturer's full range..
5. Total Thickness: 1 inch.
6. Glazing Method: Dry glazing method, gasket glazing.

D. Type IG-5 - 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 air.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
4. Total Thickness: 1 inch.

E. Type G-3 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
1. Applications:
a. Glazing in fire-rated door assembly.
b. Glazing in fire-rated window assembly.
c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
2. Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers.
3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Glazing Method: As required for fire rating.
6. Fire-Rating Period: 90 minutes.
7. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
e. "XXX" - placeholder that represents fire-rating period, in minutes.

2.05 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.

2.06 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.

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 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Acoustic insulation.
E. Gypsum sheathing.
F. Cementitious backing board.
G. Gypsum wallboard.
H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

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 C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
F. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.
I. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
K. ASTM E413 - Classification for Rating Sound Insulation 2022.
L. GA-216 - Application and Finishing of Gypsum Panel Products 2021.
M. 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 metal framing, gypsum board, accessories, and joint finishing system.

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. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. 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 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
   2. Jaimes Industries: www.jaimesind.com/#sle.
   3. Marino: www.marinoware.com/#sle.
   4. Steel Construction Systems: www.steelconsystems.com/#sle.
   5. Phillips Manufacturing Company: www.phillipsmfg.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Ceiling Channels: C-shaped.
   3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
   2. Deflection and Firestop Track:
      a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.

2.03 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. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
   3. 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.
   4. Mold Resistant Paper Faced Products:
      a. American Gypsum Company; M-Bloc.
      b. CertainTeed Corporation; M2Tech 5/8" Type C Moisture & Mold Resistant Drywall.
      c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
      d. National Gypsum Company; Gold Bond XP Gypsum Board.

e. Substitutions: See Section 016000 - Product Requirements.

5. 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.
   5. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   6. Core Type: Regular.
   7. Regular Board Thickness: 1/2 inch.
   8. Glass Mat Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand.
      b. Georgia-Pacific Gypsum; DensGlass Sheathing.
      c. National Gypsum Company; Gold Bond eXP Sheathing.
      d. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 6 inch.

B. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

C. Decorative Metal Trim:
   1. Material: Extruded aluminum alloy 6063-T5 temper.
   2. Finish: Anodized, clear.

3. Type: As shown on drawings.
4. Reveal Trim:
    a. Products:
        1) Fry Reglet.
        2) Substitutions: See Section 016000 - Product Requirements.

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. 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.

F. 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
1. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.

C. Studs: Space studs at 16 inches on center.
1. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall mounted door hardware.

3.04 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.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

3.06 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. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.07 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.
   1. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.
B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking within stud framing.
B. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.03 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
    1. Clarkwestern Dietrich Building Systems LLC: www.clarkdeitrich.com.
    2. Marino: www.marinoware.com/#sle.
    3. Simpson Strong Tie: www.strongtie.com/#sle.
    4. Substitutions: See Section 016000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
    1. Studs: C shaped with flat or formed webs with knurled faces.
    2. Runners: U shaped, sized to match studs.
    3. Ceiling Channels: C shaped.
    4. Furring: Hat-shaped and Z shaped sections, minimum depth of 7/8 inch.
    5. Steel Stud Framing Connectors:
        a. Products:
            1) Simpson Strong Tie, Bridging Connectors; DBC Bridging Connector: www.strongtie.com.
            2) Substitutions: See Section 016000 - Product Requirements.
B. Loadbearing Studs: As specified in Section 054000.
C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
D. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short .
E. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
F. Fasteners: ASTM C1002 self-piercing tapping screws.
G. Anchorage Devices: Powder actuated.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.
B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.
B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
C. Align and secure top and bottom runners at 24 inches on center.
D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
E. Align stud web openings horizontally.
F. Secure studs to tracks using crimping method. Do not weld.
G. Fabricate corners using a minimum of three studs.
H. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
I. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
B. Install furring independent of walls, columns, and above-ceiling work.
C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.
B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.
B. Tile for wall applications.
C. Coated glass mat backer board as tile substrate.
D. Ceramic accessories.
E. 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 A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
C. 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.
D. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2019.
E. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation 2019.
F. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation 2014 (Reaffirmed 2019).
G. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2022.
H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.
I. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2022.

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. 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.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
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 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. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Virginia Tile Atlas.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Porcelain Floor Tile Type PT-1: ANSI A137.1, and as follows:
   1. Atlas manufactured by Virginia .
   2. Moisture Absorption: 0 to 0.5 percent.
   3. Surface Finish: See Finish Schedule..
   4. Color(s): See Finish Schedule..
   5. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

C. Wall Tile Type CT-1 thru CT-4: ANSI A137.1, and as follows:
   1. Natural Hues manufactured by Daltile or approved equivalent product.
   2. Moisture Absorption: <6% .
   3. Size: See Finish Schedule.
   4. Thickness: 5/16"
   5. Surface Finish: See Finish Schedule.
   6. Color(s): As shown on the drawings.

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:.
    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 indicated on drawings.
    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 indicated on drawings.
    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.
B. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
C. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

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.
D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads 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 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 E1264 - Standard Classification for Acoustical Ceiling Products 2022.

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. Rockfon Manufacturing.
    2. Acoustic Ceiling Products, Inc.: www.acpideas.com.
    3. CertainTeed Corporation: www.certainteed.com.
    4. Hunter Douglas Contract: www.hunterdouglascontract.com.
    5. USG: www.usg.com.
    6. Substitutions: See Section 01 6000 - Product Requirements.
B. Acoustical Panels Type ACT-1: Painted mineral fiber,ASTM E1264 Type III, with the following characteristics:
    1. Size: 24 by 24 inches.
    2. Thickness: 5/8 inches.
    3. Composition: Formed Mineral Fiber.
    4. NRC: .55.
    5. CAC: 35.
    6. Edge: Square.

7. Surface Color: White.
8. Products:
    a. Basis of Design: Fine Fissured by Armstrong.
    b. Substitutions: See Section 016000 - Product Requirements.
9. Suspension System: Exposed grid.

C. Acoustical Panels Type ACT-2: Painted mineral fiber, ASTM E1264, Type IX with the following characteristics:
1. Size: 24 by 24 inches.
2. Thickness: 5/8 inches.
3. Composition: Formed Mineral Fiber.
4. Edge: Square.
5. Surface Color: White.
6. Products:
    a. Basis of Design: Kitchen Zone by Armstrong.
    b. Substitutions: See Section 016000 - Product Requirements.
7. 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; heavy-duty.
1. Profile: Tee; 9/16 inch wide face.
2. Construction: Double web.
3. Finish: White painted.
4. Products:
    a. Basis of Design: Rockfon by Chicago Metallic.
    b. Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

A. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid. Basis of Design: Armstrong Axiom 4" profile.

B. 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. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. 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.
D. 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.
E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
G. Do not eccentrically load system or induce rotation of runners.
H. 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.

END OF SECTION

SECTION 095400
SPECIALTY CEILINGS - USG

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specialty ceiling panels and systems.
B. Formed metal wall panel system.
C. Metal suspension system.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.
B. Preinstallation Meeting: Convene one week before starting work of this section.
C. Sequence work to ensure ceilings are not installed until building is enclosed, dust generating activities have terminated, and overhead work is completed.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of specialty ceiling panels to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
C. Product Data: Provide data on specialty ceiling components and suspension system components.
D. Samples: Two full size samples illustrating material and finish of specialty ceiling components.
E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
F. Manufacturer's qualification statement.
G. Installer's qualification statement.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 016000 - Product Requirements for additional provisions.
    2. Specialty Ceiling System Components: Provide a quantity equal to 5 percent of total product installed.

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.
    1. Minimum three years documented experience.
    2. Approved by ceiling manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver specialty ceiling components to project site in original, unopened packages.
B. Store in fully enclosed space, flat, level and off the floor.

1.07 FIELD CONDITIONS

A. Do not install specialty ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.

PART 2 PRODUCTS

2.01 SPECIALTY CEILING ASSEMBLIES

A. Refer to Room Finish Schedule and Reflected Ceiling Plans on drawings for additional ceiling assemblies information.
B. Specialty Ceiling Assembly Type MCP-1A:
   1. Surface Texture: Smooth.
   2. Composition: Electrogalvanized Steel 0.028".
   3. Color: Gun Metal Grey and Effects Sea Salt.
   4. Size: Widths: 2", 6", and 9"; Depths: 1" & 2" mix. See Drawings for pattern.
   5. Edge Profile: Linear.
   6. Perforation: Perforated M2 (Effects Sea Salt) and Unperforated M1 (Gun Metal Grey).
   7. Noise Reduction Coefficient(NRC): 0.70.
   8. Flame Spread: ASTM E 1264; Class A (FM).
   9. Light Reflectance White Panel: 0.83.
   10. Dimensional Stability: Standard.
   11. Accesories: End Caps and AX4STR - Axiom Classic- 4" straight in Gun Metal Grey.

2.02 PERFORMANCE REQUIREMENTS:

A. Design for maximum deflection of 1/360 of span.
B. Design to support imposed loads of indicated elements without eccentric loading of supports. Where supported elements may induce rotation of ceiling system components, provide stabilizing reinforcement.
C. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.03 ACOUSTICAL WALL ASSEMBLIES

A. Acoustical Wall Assembly Type MCP-1B:
   1. Surface Texture: Smooth.
   2. Composition: Electrogalvanized Steel 0.028".
   3. Color: Gun Metal Grey and Effects Sea Salt.
   4. Size: Widths: 2", 6", and 9"; Depths: 1" & 2" mix. See Drawings for pattern.
   5. Edge Profile: Linear.
   6. Perforation: Perforated M2 (Effects Sea Salt) and Unperforated M1 (Gun Metal Grey).
   7. Noise Reduction Coefficient(NRC): 0.70.
   8. Flame Spread: ASTM E 1264; Class A (FM).
   9. Light Reflectance White Panel: 0.83.
   10. Dimensional Stability: Standard.
   11. Accesories: End Caps

2.04 COMPONENT PRODUCTS

A. Specialty Suspension Systems: Armstrong Main Beam Carrier MBC2.
   1. Metal Suspension Systems - General: Complying with ASTM C635/C635M; non-directional, die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, and splices as required.
      a. Materials:
         1) Steel Grid: ASTM A653/A653M G30 coating, unless otherwise indicated.
B. Moldings and Trim:
   1. Edge Molding and Splices: Same material, thickness, and finish as metal pan panels, unless otherwise indicated.
   2. Perimeter (Wall) Moldings: Same metal and finish as grid.
      a. Size: As required for installation conditions.
      b. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

2.05 ACCESSORIES

A. Support Channels, Carriers, and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
B. Suspension Wire: Size and type as required for application, seismic requirements, and ceiling system flatness requirement specified.
    1. Concealed Suspension:
        a. Suspension Wire: Steel, annealed, galvanized finish, 12 gage, 0.0808 diameter.

2.06 FABRICATION

A. Shop fabricate ceiling components to the greatest extent possible.
B. Shop fabricate wall components to the greatest extent possible.

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.
C. Verify that field measurements are as indicated on shop drawings.
D. Do not begin installation until after interior wet work is dry.
E. Start of installation constitutes acceptance of project conditions.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.
B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
C. Install after major above-ceiling work is complete.
D. Layout ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.
B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.
C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
E. Where ducts. facility services, or 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. Edge Moldings: Install at intersection of ceiling and vertical surfaces and penetrations, using components of maximum length, set level. Provide edge moldings at junction with other ceiling finishes. Miter corners. Provide preformed edge closures to match bullnosed cornered partitions.
    1. Use longest practical lengths.

3.04 INSTALLATION - SPECIALTY CEILING UNITS

A. Install in accordance with manufacturer's instructions.
B. Fit components in place, free from damaged edges or other defects detrimental to appearance and function.
C. Cut to fit irregular grid and perimeter moldings.

1. Shape and finish field-cut edges as recommended by manufacturer to match profile of factory edges and finish.

D. Fit edge trim neatly against abutting surfaces.
E. Install specialty units level, in uniform plane, and free from twist, warp, and dents.
F. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.05 INSTALLATION - WALL PANELS:

A. Install in accordance with manufacturer's instructions.
B. Fit wall panel units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around penetrations.
C. Perimeter Trim: Field-cut trim pieces to lengths required and attach to substrates.
   1. Field miter corners at locations indicated or recommended by manufacturer.

3.06 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.07 CLEANING

A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION

SECTION 096433
LAMINATED WOOD FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laminated wood flooring.
B. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood subfloor surface.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2022.
C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2022.

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, wood species and colors available; and installation instructions.
C. Shop Drawings: Indicate floor joint pattern and termination details.
D. Samples: Submit two samples 5.25 by 12 inch in size illustrating floor finish, color, and sheen.
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 Flooring Material: 10 square yards matching installed flooring.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer Qualifications: Company specializing in performing the type of work specified in this section.
    1. Minimum three years of documented experience.
    2. Approved by manufacturer.

1.06 FIELD CONDITIONS

A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
B. Provide heat, light, and ventilation prior to installation.
C. Store materials in area of installation for minimum period of 24 hours prior to installation.
D. Maintain minimum room temperature of 65 degrees F and relative humidity in accordance with adhesive manufacturer's instructions for a minimum period of 48 hours prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laminated Wood Flooring:
    1. Basis of Design: Nydree Flooring; Engineered Acrylic Infused Hardwood Flooring - Maple: www.nydreeflooring.com.
    2. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Laminated Wood Flooring:
    1. Construction: Tongue and groove, self-locking, 5-ply laminated wood planks.

2. Species: Maple.
3. Color: As selected from manufacturer's full range for species specified above.
4. Thickness: 7/16 inch nominal.
5. Face Width: 4" inch.
6. Edge Profile: micro-bevel.
7. Length: Random, minimum of 12 inches.
8. Finish: Factory applied, 2.0 urethane containing cermaic particles (15 gloss matte).

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex. Type recommended by adhesive material manufacturer.
B. Adhesives: Water-resistant; types recommended by flooring manufacturer for project substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances required for type of substrate and ready to receive laminated wood flooring.
B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to substrate surface.
C. Verify that concrete sub-floor surfaces are ready for wood flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are outside the limits recommended by adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare sub-floor in accordance with flooring manufacturer's installation instructions.
B. Remove sub-floor ridges and bumps. Fill minor or local 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. Vacuum clean substrate.

3.03 INSTALLATION

A. Wood Flooring:
   1. Install flooring in accordance with manufacturer's installation instructions.
   2. Lay flooring in patterns indicated on drawings. Verify alignment as work progresses.
   3. Install edge strips at unprotected or exposed edges, and where flooring terminates.
   4. Secure edge strips before installation of flooring with stainless steel screws.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damaging surfaces.
B. Clean floor surfaces in accordance with the flooring manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on finished floor for 24 hours after installation.
B. Place protective coverings over finished floors; do not remove coverings until after Date of Substantial Completion.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.
B. Resilient tile flooring.
C. Resilient base.
D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
B. Section 260526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2022.
C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2018).
D. ASTM F1344 - Standard Specification for Rubber Floor Tile 2021a.
E. ASTM F1861 - Standard Specification for Resilient Wall Base 2021.
F. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing 2019.
G. ASTM F2169 - Standard Specification for Resilient Stair Treads 2015 (Reapproved 2020).
H. 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. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.
D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 016000 - Product Requirements, for additional provisions.
    2. Extra Flooring Material: 5% of square feet of each type and color.
    3. Extra Wall Base: 5% 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.
B. The resilient stage floor installation shall be the responsibility of a single Contractor, including moisture barrier, anchorage system, sleepers, resilient mounts, adhesives, acoustical batting, sub-flooring, flooring, trim, expansion provisions, and finish. This Contractor shall assume complete responsibility for the installation of the work in this Section, and shall hold the Owner, Architect, Theater Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising therefrom.
C. The Contractor shall obtain all flooring from single manufacturer or source to ensure match of quality, color, pattern, and texture.

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.
E. Do not double stack pallets.
F. 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.

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 SHEET FLOORING

A. Vinyl Sheet Flooring - Type LVT-2 & LVT-3: Homogeneous without backing, with color and pattern throughout full thickness.
   1. Manufacturers:
      a. Basis of Design: Apex & Hydro Evolve by Polyfloor.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1913.
   3. Thickness: .08 inch nominal.
   4. Sheet Width: 78 inch minimum.
   5. Seams: Heat welded.
   6. Color: As indicated on drawings.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 TILE FLOORING

A. Vinyl Composition Tile - VCT-1: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. Basis of Design: Armstrong.
      b. Substitutions: See Section 016000 - Product Requirements.
   2. Size: 12 by 12 inch.
   3. Thickness: 0.125 inch.
   4. Color: Per Owner; match existing.

B. Rubber Tile - Type RBF-1 thru RBF-3: Homogeneous, color and pattern throughout thickness.
   1. Manufacturers:
      a. Basis of Design: Nora by Envirocare.
   2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
   3. Size: 24.015 by 24.015 inch nominal.
   4. Total Thickness: .08 inch.
   5. Texture: Smooth.
   6. Color: As indicated on drawings.

2.03 RESILIENT BASE

A. Resilient Base - Type VCB-1 & VCB-2: ASTM F1861, Type TS rubber, vulcanized thermoset; 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: Johnsonite
    a. Burke Flooring: www.burkemercer.com.
    b. Roppe Corp: www.roppe.com.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

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. 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 sub-floor conditions.
B. Install in accordance with manufacturer's written instructions.
C. Adhesive-Applied Installation:
    1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 260526 for grounding and bonding to building grounding system.
    2. Fit joints and butt seams tightly.
    3. Set flooring in place, press with heavy roller to attain full adhesion.
D. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.
E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
H. Install flooring in recessed floor access covers, maintaining floor pattern.
I. At movable partitions, install flooring under partitions without interrupting floor pattern.
J. Spread only enough adhesive to permit installation of materials before initial set.
K. Fit joints and butt seams tightly.
L. Set flooring in place, press with heavy roller to attain full adhesion.
M. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
N. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
O. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at

seams.

B. Seal seams by heat welding where indicated.
C. Double cut sheet at seams.
D. Lay flooring with tightly butted seams, without any seam sealer unless otherwise indicated.

3.05 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.

3.06 COORDINATE INSTALLATION WITH ALL OTHER TRADES DOING ADJOINING WORK.

3.07 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.

3.08 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean in accordance with manufacturer's written instructions.

3.09 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. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
E. 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. Milliken & Company: www.milliken.com/#sle.
    2. Philadelphia Queen - Shaw.
    3. Patcraft.
    4. EF Contract Flooring.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1 thru CPT-3: Multi-Level Pattern Loop, manufactured in one color dye lot.
    1. Product: See Finish Schedule manufactured by Patcraft.
    2. Tile Size: See Finish 24 x 24 inch, nominal.
    3. Color: See Finish Schedule.
    4. Installation Method: See Finish Schedule
B. Carpet Tile Type CPT-4: Textile Composite, manufactured in one color dye lot.
    1. Product: kinetex manufactured by EF Contract.
    2. Tile Size: 24 x 24, nominal.
    3. Color: Rush.

4. Primary Backing Material: Polyester Felt Cushion
5. Installation Method: Ashlar.

C. Carpet Tile Type CPT-8: Interloop Patterned Loop, manufactured in one color dye lot.
1. Product: Steam Plank manufactured by Atlas.
2. Tile Size: 12 x 36 inch, nominal.
3. Color: Splash.
4. Gage: 1/12 inch.
5. Weight: 22 oz/sq yd
6. Pattern: 13TT.
7. Primary Backing Material: Perma-tile Vinyl

D. Carpet Tile Type WLK-1: Tufted, Cut Pile, manufactured in one color dye lot.
1. Product: Obex Bar manufactured by Milliken.
2. Plank Size: 10.87" x 39.37".
3. Color: Dark Grey.
4. Nominal Thickness: .43".
5. Bar Material. Extruded aluminum with high density polyethylene foam base layer.

E. Carpet Tile Type WLK-2: Multi-Level Pattern Loop, manufactured in one color dye lot.
1. Product: Step Right In manufactured by Philadelphia Commercial.
2. Size: 24" x 24".
3. Color: Strut.
4. Gage: 1/12 inch.
5. Stitches: 9 per inch.
6. Installation Method: Random.

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. Stair Nosing: Anodized aluminum angle.
1. Basis of Design: Kuberit KS-A.
2. Style & Finish: See Finish Schedule

D. 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.

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. 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 square pattern, with pile direction parallel to next unit, set parallel to building lines.
F. Trim carpet tile neatly at walls and around interruptions.
G. 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 097800
INTERIOR WALL PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative plastic wall paneling.
B. Laminated interior wall paneling.

1.02 REFERENCE STANDARDS

A. ASTM C393/C393M - Standard Test Method for Core Shear Properties of Sandwich Constructions by Beam Flexure 2020.
B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).
C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics 2022.
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.
C. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.
    1. Scale of Drawing Elevations: 1/4 inch to 1 foot, minimum.
    2. Scale of Drawing Details: 1-1/2 inches to 1 foot, minimum.
D. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panels.
E. Manufacturer's Instructions: Provide manufacturer's installation instructions.
F. Maintenance Data: Include recommended instructions, methods, and materials for cleaning panels.
G. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 016000 - Product Requirements, for additional provisions.
    2. Extra Panels: Quantity equal to 5 percent of total installed.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
B. Installer Qualifications: Company specializing in installing work of the type specified in this section, and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.
B. 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.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.
B. Extended Correction Period: Correct defective work within a 5-year period for failure of materials or workmanship commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Plastic Wall Paneling: Basis of Design: Polyclad Pro by Polyflor-Wall
    1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Surface Burning Classification: Provide wall paneling assemblies meeting Class A when tested in accordance with ASTM E84.

2.03 DECORATIVE PLASTIC WALL PANELING

A. Decorative Plastic Wall Paneling: Digitally-printed pattern images with manufacturer's standard scratch-resistant, UV-resistant protective coating.
   1. Panel Thickness: .5 inch.
   2. Material: Corrugated polyvinyl chloride (PVC).
      a. Flexural Strength: Greater than 2000 ft lbf/sq in, when tested in accordance with ASTM C393/C393M.
      b. Tensile Strength: Greater than 1300 ft lbf/sq in, when tested in accordance with ASTM D638.
      c. Impact Strength: Greater than 1.57 ft lbf/in, when tested in accordance with ASTM D256.
   3. Edges: Square.

END OF SECTION

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.
B. Mounting accessories.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2022.
B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests 2016.

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, and fabric orientation.
D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
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 Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

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.

PART 2 PRODUCTS

2.01 FABRIC-COVERED SOUND-ABSORBING UNITS

A. Manufacturers:
    1. Basis of Design: Acousti-Panels by G&S Acoustics.
    2. Basis Design: Acousti-Tack by G&S Acoustics.
    3. Substitutions: See Section 016000 - Product Requirements.

B. Sound Absorbing Units: Prefinished, factory assembled fabric panels.
    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.

C. Fabric Acoustical Panels for Walls (AWP-1):
    1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
        a. Facing: 1/16 inch impact-resistant and tackable surface laminated to core.
    2. Core Density: 6 to 7 lb/cu ft.
    3. Noise Reduction Coefficient (NRC): 70 when tested in accordance with ASTM C423 for Type I mounting, per ASTM E795.

4. Panel Thickness: 2 inches.
5. Edges: Perimeter edges reinforced by a formulated resin hardener.
6. Corners: Square.
7. Fabric: 100% Polyester.
8. Color: See Finish Schedule.
9. Patterns: Where fabric with directional or repeating patterns or fabric with directional weave is used, mark for installation in same direction.
10. Mounting Method: Spline-mounted, concealed.

2.02 FABRICATION

A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
   1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
   2. For panels suspended from ceiling, provide fabric covering both sides, with seams only at panel edges.

B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.03 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: As selected from manufacturer's standards.

B. Fixing Clips: Manufacturers standard for application as indicated.

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 indicated, following manufacturer's installation instructions.
B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
C. 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 fabric facing 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 completion of the work.
B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints.
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, 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 055000 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, 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 three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
D. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, 4 x 8 inch in size.
E. Manufacturer's Instructions: Indicate special surface preparation procedures.
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 three years documented 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 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. Do not apply 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 80 ft candles 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. Primer Sealers: Same manufacturer as top coats.
D. Block Fillers: Same manufacturer as top coats.
E. Substitutions: See Section 016000 - Product Requirements.

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 applicable code for surface burning characteristics.
D. Colors: To be selected from manufacturer's full range of available colors.
   1. In finished areas, 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 ME-OP-2A - 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; Devoe's DevGuard Semi-Gloss Alkyd 4306-xxxx.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck.

1. Shop primer by others.
2. Intermediate Coat: same as finish.
3. Top Coat: Waterborne Flat Dryfall: P&L Industrial Waterborne Flat Dryfall Z5900
4. Flat: MPI gloss level 1; use this sheen at all locations.

B. Paint WI-OP-3L - Wood, Opaque, Institutional Low-Odor/VOC Latex System MPI INT 6.4R, 3 Coat:
1. Prime Coat: Primer Latex, for interior wood, MPI #39.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143 and Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 2), MPI #144.

C. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
1. One coat of block filler, latex, interior/exterior, MPI #4.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, eggshell (MPI Level 2), MPI #144.

D. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.
2. Semi-gloss: Two coats of alkyd enamel; P&L Pro-Hide Gold Interior Alkyd Semi-Gloss S889xseries.

E. 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.

F. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143; Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144 and Latex, interior, institutional low odor/VOC, gloss (MPI Gloss Level 6), MPI #148.

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: Latex filler.
C. Fastener Head Cover Material: Latex 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: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

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 or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
D. Seal surfaces that might cause bleed through or staining of topcoat.
E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
F. 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. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
I. 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).
J. 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 hand 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.
K. 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. Re-prime entire shop-primed item.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
B. Apply products in accordance with manufacturer's instructions.
C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
D. Apply each coat to uniform appearance.
E. Sand metal surfaces lightly between coats to achieve required finish.
F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

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. Markerboards and Tackboards.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.
B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard 2012 (Reaffirmed 2020).
B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling 2018.
C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics 2020.
D. PS 1 - Structural Plywood 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's data on chalkboard, markerboard, tackboard, tackboard surface covering, trim, and accessories.
C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
D. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.
E. Manufacturer's printed installation instructions.
F. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 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.

1.06 MANUFACTURERS

A. Visual Display Boards:
   1. MooreCo, Inc: www.moorecoinc.com.
   2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
   3. Polyvision Corporation (Nelson Adams): www.polyvision.com.
   4. Substitutions: See Section 016000 - Product Requirements.

1.07 VISUAL DISPLAY BOARDS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Color: White.
   2. Steel Face Sheet Thickness: 24 gage, 0.0239 inch .
   3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   4. Backing: Aluminum foil, laminated to core.
   5. Size: As indicated on drawings.
   6. Frame: Extruded aluminum , with concealed fasteners.
   7. Frame Finish: Anodized, natural.
   8. Accessories: Provide chalk tray, map rail, and flag holder.

B. Markerboards: GM-1.
   1. Material: 1/4" tempered safety writing glass.
   2. Color: White.
   3. Size: As indicated on drawings.
   4. Finish: Magnetic.
   5. Mounting: Float Mount.
   6. Accessories: Provide chalk tray.
   7. Manufacturers:
      a. Basis of Design: Glassboards by Clarus.

b. Substitutions: See Section 016000 - Product Requirements.

C. Tackboards: Fabric laminated to cork.
1. Cork Thickness: 1/8 inch.
2. Fabric: Vinyl coated fabric.
3. Color: As selected from manufacturer's full range.
4. Size: As indicated on drawings.
5. Frame: Extruded aluminum , with concealed fasteners.
6. Frame Finish: Anodized, natural.

D. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.
1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
2. Configuration: As indicated on drawings.

1.08 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
B. Vinyl Coated Fabric: ASTM F793 Category VI.
C. Plywood: PS 1 Grade C-D , softwood.
D. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).
E. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

1.09 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
C. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
D. Chalk Tray: Aluminum, manufacturer's standard profile, one piece full length of chalkboard, molded ends, concealed fasteners, same finish as frame.
E. Mounting Brackets: Concealed.

PART 3 EXECUTION

2.01 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.

2.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

2.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.
B. Secure units level and plumb.

2.04 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.

SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.
B. Building identification signs.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
B. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

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 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 Aspen 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.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, 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 indicated on 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. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
9. Include Occupant Load on room signage.

C. Building Identification Signs:
1. Use individual metal letters.
2. Mount on outside wall in location indicated on drawings.

D. Other Dimensional Letter Signs: Wall-mounted.

2.03 SIGN TYPES

A. Flat Signs: Signage media in aluminum frame.
1. Corners: Square.
2. Frame Finish: Natural (clear) 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 DIMENSIONAL LETTERS

A. Metal Letters:
1. Metal: Aluminum channel.
2. Metal Thickness: 1/8 inch minimum.
3. Letter Height: As indicated on drawings.
4. Text and Typeface:
   a. Character Font: Helvetica, Arial, or other sans serif font.

b. Character Case: Upper case only.

5. Mounting: Concealed.
6. Lighting: Halo lit.

2.06 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 damaged items.

END OF SECTION

SECTION 102113.13
METAL TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal toilet compartments.
B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.
B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

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, floor, and ceiling supports, door swings.
C. Product Data: Provide data on panel construction, hardware, and accessories.
D. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Toilet Compartments: Basis of Design: Bradley Corporation
   1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
   2. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   3. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
   4. General Partitions Mfg. Corp: www.generalpartitions.com/#sle.
   5. Hadrian: www.hadrian-inc.com/#sle.
   6. Metpar Corp: www.metpar.com/#sle.
   7. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
B. Stainless Steel Sheet: ASTM A666, Type 304.

2.03 COMPONENTS

A. Toilet Compartments: Powder coated steel, floor-mounted unbraced.
B. Doors, Panels, and Pilasters: Sheet steel faces, pressure bonded to sound deadening core, formed and closed edges; corners made with corner clips or mitered, welded, and ground smooth.
   1. Panel Faces: 20 gauge, 0.0359 inch.
   2. Door Faces: 22 gauge, 0.0299 inch.
   3. Pilaster Faces: 20 gauge, 0.0359 inch.
   4. Reinforcement: 12 gauge, 0.1046 inch.
   5. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.
C. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Door Width: 24 inch.

3. Door Width for Handicapped Use: 36 inch , out-swinging.
4. Height: 58 inch.

D. Pilasters: 1-1/4 inch thick, of sizes required to suit compartment width and spacing.
E. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

2.04 ACCESSORIES

A. Pilaster Shoes: Formed chromed steel with polished finish, 3 inch high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
B. Head Rails: Hollow chrome-plated steel tube, 1 by 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
C. Brackets: Polished chrome-plated non-ferrous cast metal.
D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
E. Hardware: Polished chrome plated non-ferrous cast metal:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Thumb turn or sliding 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.

2.05 FINISHING

A. Powder Coated Steel Compartments: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat and two finish coats powder coat enamel.
B. Stainless Steel Compartments: No. 4 finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that field measurements are as indicated.
C. Verify correct spacing of and between plumbing fixtures.
D. 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 enamel 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 102239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Folding panel partitions.
B. Ceiling track, ceiling guards, and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking and track support shimming.
B. Section 079005 - Joint Sealers: Acoustical sealant.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
C. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
F. ASTM E413 - Classification for Rating Sound Insulation 2022.
G. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions 2012 (Reapproved 2020).
H. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures 2022.
I. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
    1. Require attendance by representatives of installer.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.
E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.
G. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and installation sequence.
H. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified 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.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within five year period after Date of Substantial Completion.
C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Basis of Design: Modernfold 932.
   1. Hufcor, Inc: www.hufcor.com.
   2. Kwik-Wall Company: www.kwik-wall.com.
   3. Panelfold, Inc: www.panelfold.com.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Side opening; paired panels; side stacking; manually operated.
B. Panel Construction:
   1. Frame: 16 gage, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   2. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
   3. Hinges: Full leaf butt hinges.
   4. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system; pull bars.
   5. Panel Properties:
      a. Thickness With Finish: 3 inches.
      b. Width: Standard width.
      c. Weight: 11 lb/sq ft.

C. Panel Finishes:
   1. Facing: Vinyl coated fabric.
   2. Exposed Metal Trim: selected from manufacturer's standard range.

D. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:
   1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
   2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:
   1. Acoustic Performance:
      a. Sound Transmission Class (STC): 48 to 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
   2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Accessories:

1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, and intermediate meeting posts.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch thick, maximum permissible length; ends square cut, square edges.
C. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.
D. Acoustic Insulation:
   1. Type: As required for acoustic performance indicated.
   2. Thickness: As required for acoustic performance indicated.

2.04 COMPONENTS

A. Operable Panel Partition: Side opening; paired panels; side stacking; manually operated.
   1. Panel Finish: Vinyl coated fabric .
   2. Noise Reduction Coefficient (NRC): ASTM E596, NRC of 0.65 minimum.
   3. Sound Transmission Class (STC): 48-52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
B. Hardware: Latching door handles of Aluminum "D" door pull, 18", anodized dark bronze finish; lock cylinder keyed to building keying system; pull bars.
C. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.
D. Accessories: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, and intermediate meeting posts.
E. Pocket Enclosures: Door, frame, and trim to match adjacent walls.
F. Acoustic Sealant: Partition manufacturer's standard type .

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.
C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.
B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.
C. Fit and align partition assembly and pocket doors level and plumb.
D. Lubricate moving components.
E. Install acoustic sealant to achieve required acoustic performance.
F. Coordinate electrical connections.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.
B. Condition chalkboard surfaces in accordance with manufacturer's instructions.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

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 102113.19 - Plastic Toilet Compartments.

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 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
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 2021.
F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

1.04 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories: Basis of Design Bobrick Washroom Equipment, Inc.
    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, 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. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface-mounted, stainless steel unit with pivot hinge, tumbler lock.

1. Products:
    a. Bobrick B-265.
    b. Substitutions: Section 016000 - Product Requirements.

B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
1. Capacity: 400 C-fold minimum.
2. Products:
    a. Bobrick B-262.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
1. Minimum Capacity: 40 ounces.
2. Products:
    a. Bobrick B-2111.

D. Mirrors: 1/4 inch thick annealed float glass; ASTM C1036.
1. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
2. Products:
    a. Bobrick B-165.
    b. Substitutions: Section 016000 - Product Requirements.

E. Grab Bars: Stainless steel, smooth surface.
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.

F. 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. Products:
    a. Bobrick B-254.
    b. Substitutions: Section 016000 - Product Requirements.

2.05 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
1. Holders: Three spring-loaded rubber cam holders.
2. Length: 36 inches.

B. 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 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. 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. 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.
8. Ansul, a Tyco Business: www.ansul.com/#sle.
9. JL Industries, Inc: www.jlindustries.com.
10. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
11. Potter-Roemer: www.potterroemer.com/#sle.
12. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
13. Strike First Corporation of America; EL-Elite Architectural Series Fire Extinguisher Cabinet, Non-Fire Rated: www.strikefirstusa.com.

2.02 FIRE EXTINGUISHERS

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.

C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
1. Class: K type.
2. Size: 1.6 gallons.
3. Finish: Polished stainless steel.
4. Temperature range: Minus 20 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed aluminum.
B. Cabinet Configuration: Recessed type.
    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: No. 4 - Brushed stainless steel.
H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. 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.

END OF SECTION

SECTION 105100
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

D. Samples: Submit two samples 2 by 3 inches in size, of each color scheduled.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
1. Art Metal Products: www.artmetalproducts.com.
2. Lyon Workspace Products: www.lyonworkspace.com.
3. Penco Products, Inc: www.pencoproducts.com.
4. Republic Storage Systems Co: www.republicstorage.com.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Student Lockers: Single tier metal lockers, wall mounted with matching closed base.

Basis of Design: Republic Storage Systems Standard Locker.
1. Width: 15 inches.
2. Depth: 15 inches.
3. Height: 72 inches
4. Fittings: Hat shelf, 2 coat hooks.
5. Locking: Built-in combination locks.
6. Provide sloped top.

B. Athletic Metal Lockers Two tier metal lockers, wall mounted with matching closed base.

Basis of Design: Athletic Edge Ventilated Locker SS3.
1. Width: 15 inches.
2. Depth: 12 inches.
3. Height: 72 inches.
4. Fittings: Hat shelf, 2 coat hooks.
5. Locking: Padlock hasps, for padlocks provided by Owner.

C. Locker Benches: Free standing type; bench top of laminated maple; trapezoidal-shaped, black anodized aluminum pedestals.
1. Height: 17-1/2"

2. Length: As shown on Drawings

2.03 METAL LOCKERS

A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Color: To be selected by Architect.

B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
   1. Body and Shelves: 16 gage, .0598 inch.
   2. Back: 18 gage, .0478 inch.
   3. Metal Base Height: 4 inch.

C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. Door Frame: 16 gage, 0.0598 inch, minimum.
   2. Provide ventilation slots in top and bottom of door frame.

D. Doors: Hollow channel edge construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
   1. Door Outer Face: 16 gage, .0598 inch, minimum.
   2. Form recess for operating handle and locking device.
   3. Provide ventilation slots in top and bottom of door.

E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.

F. Sloped Top: 20 gage, 0.0359 inch, with closed ends.

G. Trim: 20 gage, 0.0359 inch.

H. Coat Hooks: Stainless steel or zinc-plated steel.

I. Number Plates: Provide oval shaped aluminum plates. Form numbers no less than 1/2" inch high of block font style with ADA designation, in contrasting color.

J. Locking device supplied by Owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install accessories.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 105617
WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shelf standards, brackets, and accessories.
B. Shelves.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

2.02 MATERIALS

A. Heavy-Duty Shelf Standards and Brackets: Double-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
   1. Acceptable Product: Knape & Vogt KV 82/182.
   2. Load Capacity: Recommended by manufacturer for loading of 300 to 450 pounds per pair of standards.
   3. Lengths: As indicated on drawings.
   4. Finish: Powder-coated.
   5. Color: To be selected by Architect from manufacturer's full line.
   6. Brackets: Double tab type, locking into slots; size to suit shelves; same finish as standards.
   7. Bracket Quantity: Provide one bracket for each 18 inches of standard length.

B. Laminate Faced Shelves: Particleboard or medium density fiberboard covered with high pressure decorative laminate on both sides.
   1. Edge Finish: Matching laminate, all four edges.
   2. Substrate Thickness: 3/4 inch, nominal.
   3. Length: 36 inches.
   4. Laminate Color and Pattern: To be selected by Architect from manufacturer's standard line.

C. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions.

END OF SECTION

SECTION 114000

FOODSERVICE EQUIPMENT

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. All work of this section shall be performed in accordance with the requirements of the Contract Documents.

B. Provide all labor, materials, equipment, and services as required for complete installation of all kitchen and food service equipment and related work as shown on the drawings, reasonably inferred as part of the food service equipment, or specified herein.

C. If the documents or specifications are unclear or conflicting of the other, request clarification in writing from the Architect or Consultant prior to bidding. Plans and specifications shall be considered as mutually explanatory and work required by one, but not by the other, shall be performed as though required by both. Items required by one, but not the other shall be provided as though required by both.

D. All equipment specified is to be new and unused at the time of delivery unless noted otherwise.

E. Kitchen Equipment Contractor shall verify all critical measurements and familiarize themselves with the construction of the building. They will be held responsible for the correct size of all equipment and proper fit at the time of delivery and installation. Review of submittal will not relieve KEC of their responsibility to field verify critical dimensions and details.

F. Secure and pay fees for all permits, licenses, and inspections are required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations, and contract requirements directly related to this section of the contract documents.

G. Preform work in a timely manner consistent with the construction schedule. Provide the Architect with written notice of any delay in equipment delivery or installation.

H. Portions of this work may be subcontracted to those qualified to do such work. Kitchen Equipment Contractor shall provide a list of anticipated subcontracts to include business name and description of the work and materials subcontractor will be responsible for.

1.02 RELATED WORK SPECIFIECD IN OTHER SECTIONS

A. Electrical Contractor will rough-in for and make final connections to all food service equipment. Electrical components, disconnects, motor starters, switches, and devices are to be provided by Electrical Contractor unless specified otherwise.

B. Mechanical Contractor will rough-in for and make final connections to all food service equipment for water, waste, vent, and gas. Plumbing components, stops, shut offs, traps, strainers, valves, and fittings are to be provided by Plumbing Contractor unless specified otherwise.

C. Mechanical Contractor will provide and install kitchen exhaust fans, ducts, and make up air. KEC to provide and install hoods, electrical control package for cook line hood, and fire suppression system.

D. Any chase, sleeve, or conduit underground or overhead required for refrigeration lines, beverage lines, or CO2 lines will be furnished and installed by Mechanical Contractor, Electrical Contractor, or General Contractor.

E. General Contractor to insulate floor slab(s) for walk in cooler and freezer. KEC to coordinate insulation of slab needed for cooler by providing submittal of detailed and dimensioned drawings. KEC to field verify insulating of slab(s) prior to fabrication of cooler and freezer. Inform Architect or Consultant of any discrepancies.

F. General Contractor to provide structural support at walls and ceilings where specified.

G. General Contractor to provide slab depressions to receive trench/trough drain assemblies provided under this section.

H. Electrical Contractor and Mechanical Contractor to disconnect Owner's existing equipment as part of this project. Owner to remove and store exiting equipment that is to be relocated and used as a part of this project. KEC to set in place Owner's relocated existing equipment and make ready for connection to utilities. Electrical Contractor and Mechanical Contractor to reconnect Owner's existing equipment once relocated.

1.03 DEFINITIONS

A. All references to the terms "KEC", "Food Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.

B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative.

C. The phrase "The KEC shall" or "by the K.E.C.", as applicable, is understood to be included as part of each sentence, paragraph or requirement of these specifications unless otherwise noted or specified.

1.04 SUBMITTALS

A. General Requirements:
   1. Identify each submittal by project name, date, and submittal name.
   2. Submit items B,C, and D below as one complete submittal package. Submit to Architect within 45 days of award of contract.
   3. Submit item F below prior to Demonstrations and Substantial Completion.
   4. The approval of shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, quantities, and specified work in the specifications and contract documents.

B. Rough-in Drawings:
   1. Submit rough-in drawings electronically in PDF format professionally prepared from architects dimensioned plans at a minimum scale of ¼" = 1'-0".
   2. Submit plan view showing arrangement of all items specified and identified on equipment list by item number, description, and quantity.
   3. Submit plumbing rough-in and electrical rough-in showing dimensioned locations, sizes, elevations, and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
   4. Submit special conditions plan showing exact dimensions and details of all floor depressions, wall openings, reinforcing for wall and/or ceiling mounted equipment, and chase or conduit locations for beverage lines, refrigeration lines, etc.

C. Fabricator's and Manufacturer's Drawings:
   1. Submit shop drawings electronically in PDF format of equipment specified for custom fabrication including all accessories attached to each item.
   2. Drawings shall be detailed and dimensioned to a minimum scale of ¾" = 1'-0".
   3. Drawings will be reviewed and returned for corrections, if necessary.

D. Equipment Cut Sheets:
   1. Submit electronic files in PDF format of manufacturer's cut sheets and technical data for approval prior to procurement. All items of Manufacture's standard production shall be submitted, including items purchased to be built into fabricated equipment. Each cut sheet shall be marked to accurately descried the item to be furnished. Include all deviations from standard information (e.g., voltage, gas type, etc.).
   2. Include a separate cover sheet ahead of each item showing manufacturer, model, optional features included, and all accessories specified.

E. Correct and Resubmit:
   1. Revise original drawings per notes and resubmit per original submittal procedure.
   2. Note on drawings all changes that have been made.

3. Revise equipment cut sheet submittal per review notes and resubmit per original procedure.
4. Do not proceed with procurement until final approval of submittal has been given to KEC by Architect or Consultant.
5. Once approval has been complete, provide as many prints as are needed for trades, the Owner, the Architect, and the Consultant.

F. Maintenance and Operating Manuals:
1. Submit electronic files in PDF format for all mechanically operated equipment of this section. Include operating instructions, cleaning instructions, maintenance instruction, parts listing, warranties, and similar applicable information.

G. List of Values:
1. Provide itemized cost of foodservice equipment identified by Item number and description as shown on drawings and listed in specifications. Include cost of options and accessories as per the contract documents
2. Submit to architect within 45 days of award of contract.

1.05 INTERPERTATION OF DOCUMENTS

A. Where there is a discrepancy between drawings and specifications, the higher in quality or greater in quantity shall be included. Bidders should seek clarification of any discrepancies from the architect or Consultant prior to bidding.

1.06 SUBSTITIUTIONS

A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.

B. Requests for substitution shall be sent to the Architect. Such requests must be received by the Architect 14 or more days prior to the bid date and include brand, model, features, and specifications to support equal or greater value. Any substitution requested must conform to the space limitations of layout and match the present utility requirements as listed in the bid documents.

C. Provide all design and engineering services required to modify layout, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

D. Owner reserves the right to accept or reject any or all substitution proposals before execution of contract.

1.07 REGULATIONS AND CODES

A. Equipment provided and work performed shall comply with codes, laws, ordinances, rules, and regulations of the authority having jurisdiction.

B. Equipment provided and work performed shall comply with the rules and regulations of the governing health department.

C. Equipment provided and work performed shall comply with current edition of the minimum standards required by the following organizations and where applicable bear the seal or label of the same.
1. AGA, American Gas Association
2. ANSI, American National Standards Institute
3. ASHRAE, American Society of Heating, Refrigeration and Air Conditioning Equipment
4. ETL, Intertech Testing
5. Food and Drug Administration HAACP Guidelines
6. NEC, National Electrical Code
7. NFPA, National Fire Protection Association
8. NSF, National Sanitation Foundation
9. UL, Underwrites Laboratories

D. Notify Architect or Consultant of any item that does not comply prior to purchase or installation of the item.

1.08 WARRANTY

A. Equipment shall be guaranteed for a minimum period of one (1) year from the date of Substantial Completion. Warranty shall cover the cost of all parts and labor necessary to complete the repair or replacement.

B. Provide an additional four (4) year extended warranty on compressors. Warranty to cover labor costs for the first year.

C. KEC shall not be responsible for equipment failure due to improper maintenance or misuse by the Owner's Representative(s).

D. KEC shall not be responsible for warranty on existing or relocated equipment.

E. Complete warranty registration forms and delver to Owner's Representative.

F. Provide a list of all equipment and their respective authorized service agencies indicating address and phone number of contact person or business. Include on list of equipment: Manufacturer, Model number, and Serial number.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. As per itemized list of food service equipment included in SECTION 114000 and as represented in the contract documents and drawings.

2.02 STANDARD PRODUCTS

A. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such equipment, products, and materials and shall be the manufacturer's latest model that complies with the specifications provided.

B. Discrepancies within the documents shall be brought to the attention of the Architect and Consultant for clarification prior to bidding or ordering of standard items.

2.03 WALK-IN COOLERS AND FREEZERS

A. Walk-in Coolers and Freezers are to include all panels, parts, components, equipment, materials, and labor for a complete and operational assembly. Walk-ins are to be sectional assemblies the size and shape as indicated on the drawings. To be assembled in place as per the drawings and installed as per the manufacturer's instructions.

B. If compartment dimensions exceed clear-span ability of ceiling panels, provide and install manufacturer's recommended ceiling support system. Structural support for the same to be provided by General Contractor. Attachment to structural support to be provided by KEC.

C. Walk-in Cooler and Freezer refrigeration system(s): Provide and install all components, parts, materials, and labor for a complete and operational system. To include the following: condensing unit; blocking or stand for condensing unit; evaporator coil; copper drain line; heat tape for drain line on freezer compartments; controls; filter dryer; site glass; suction line; liquid line; Armaflex insulation or equal on suction and liquid lines; refrigerant; and all other parts and components needed for a complete and operating refrigeration system.

D. Pre-approved vendor: Kolpak. Contact for dealer pricing: Garrett Zimmerman, Vader and Landgraf, Inc., (612) 331-1251, garrett@vaderandlandgraf.com

2.04 CUSTOM FABRICATION STAINLESS STEEL PRODUCTS

A. Qualifications of Fabricators:
   1. Fabricators shall be NSF approved with trained personnel and facilities to properly design and fabricate equipment in accordance with industry standards and the specifications and standard details contained herein.
   2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval.

3. All custom stainless equipment will be fabricated at the same shop.
4. Each fabricated unit will include all necessary reinforcing, bracing, and welding with the proper number and spacing of supports such that there will be no noticeable deflection.
5. Pre-approved fabricator: Infinity Metal Fabricating, Steve McGrath, (320) 302-5001, steve@infinitymetalfabmn.com
6. Pre-approved fabricator: Two Rivers Enterprises, Bob Struzyk, (320) 746-3156, bobs@stainlesskings.com

B. Custom Fabricated Dish Tables:
1. 14-gauge 18-8 stainless steel top, type 304 stainless, polish to #4 finish.
2. Tops shall have all seams and corners welded, ground smooth and polished.
3. All corners, both vertical and horizontal coved on a ¾" radius.
4. Front and exposed ends fabricated with 3" high, 1 ½" rolled edge with rounded corners.
5. Support top with framework of 1" x 4" x 1" stainless steel channel bracing secured to underside of top surfaces with 1/4" studs welded 9" on center maximum with chrome-plated washer, lock washer and cap nut. Channel framework to include members front to back and full length of top to withstand heavy loads without deflection. Exposed ends of channel bracing capped. Studs: such length that cap nuts can be drawn tight, bringing top down securely on frame eliminating all vibrations.
6. Sound Deadening: Provide sound deadening sealant tape positioned continuously between all frame-members and underside of stainless-steel surface. Tighten stud-bolts for maximum compression of sealant and trim excess.
7. Splash at walls: Turn top up specified height, 2" wide splash, return to wall on 45-degree angle, turn down 1" at rear of splash. Secure splash turndown to wall with 4" long 14-gauge stainless steel "Z" clip anchored to wall on 48" centers max. Cap ends of any exposed back splash or end splash.
8. Where service utilities or support posts penetrate tops install chrome-plated grommet assembly or integrally welded stainless-steel flange ground and polished to match top.
9. Field joints shall be provided where necessary. Indicate location and type on submittal drawings. Field joints are to be welded, ground smooth and polished to match adjacent surfaces. Welds are to be continuous.

C. Custom Fabricated Open Bases:
1. 1-5/8" diameter 16-gauge stainless steel tubing legs. 1-1/4" diameter cross rails fully welded to legs. Welds to be ground and polished. Cross rails placed at 10" floor to centerline of cross rail.
2. Leg to be inserted in leg socket similar to Component Hardware #A20-0206-C. Socket fully welded to table frame or sink bottom. Leg to include adjustable foot insert similar to Component Hardware #A10-0851-C.
3. Undershelves to be 16-gauge stainless steel and welded in place. All welds to be ground smooth and polished. Cove up 2" at rear of shelf. Turn shelf down 1-1/2" at front with 3/4" hem. Brace shelf with 4" wide stainless steel hat channel.

D. Custom Fabricated Sinks and Drainboards:
1. Size and shape as indicated on the drawings.
2. 14-gauge 18-8 stainless steel top, type 302 stainless, polish to #4 finish.
3. Sinks shall have all interior corners coved both vertical and horizontal on a 3/4" radius and shall be welded, ground smooth, and polished to match adjacent surfaces.
4. 1-1/2" wide double wall sink partitions with flat tops between compartments.
5. Drainboards shall be constructed of the same material as the integral sink(s).
6. Drainboards shall be pitched 1/8" per foot and drain back to sink.

E. Custom Fabricated Pass Shelf Assemblies:
1. Refer to details provided in specifications and drawings.

F. Stainless Steel Wall Panels:
1. Shall be 20-gauge material polished to #4 finish.
2. Affix to wall with heat resistant adhesive, no visible fasteners allowed.

3. Panels shall be 48” wide and installed with vertical seams.
4. Continuous panels vertically, no exposed horizontal seams allowed.
5. 120” End caps – J63-1451-10 Component Hardware Group
6. 120” Divider bars – J64-1450-10 Component Hardware Group
7. KEC to cut openings in panels for utilities as needed at time of install.
8. Panels shall cover wall from top of cove base to ceiling. KEC refer to architectural plans for heights of both.

2.05 RELOCATE OWNER’S EXISTING EQUIPMENT

A. Electrical Contractor and Mechanical Contractor to disconnect Owner’s existing equipment as part of this project. Owner to remove and store exiting equipment that is to be relocated and used as a part of this project. KEC to set in place Owner’s relocated existing equipment and make ready for connection to utilities. Electrical Contractor and Mechanical Contractor to reconnect owner’s existing equipment once relocated.

PART 3 EXECUTION

3.01 DELVIERY AND PREPERATION FOR INSTALL

A. Prior to the installation of foodservice equipment, the site and existing conditions shall be examined by the KEC and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect or Consultant in writing. Do not proceed with install until unsatisfactory conditions have been resolved.

B. Foodservice equipment drawings are conceptual and intended to represent layout, arrangement, mechanical and electrical requirements. KEC shall field verify all critical measurements at the building prior to the fabrication of all custom equipment. Inform Architect or Consultant of dimensional discrepancies and/or deficiencies.

C. Receive and store equipment in an area protected from weather as to prevent corrosion or damage to the equipment during the storage period.

D. Deliver equipment to the job site only after the building is weather safe.

E. Coordinate with General Contractor site readiness for delivery and install of foodservice equipment to include delivery when adequate openings in the building are available to receive the equipment into the space.

3.02 INSTALLATION

A. Kitchen Equipment Contractor shall furnish all materials, components, labor, storage, transportation, and delivery for equipment included within this section and related contract documents. All equipment shall be installed as indicated on the drawings excluding all mechanical and electrical connections as specified elsewhere. Installation shall be completed per Manufacturer’s installation instructions.

B. KEC shall uncrate, assemble, square, level, place, and make ready all items for the final connection to utilities. Parts shipped loose but required for connection shall be labeled to clearly indicate the equipment they serve and shall be accompanied by necessary installation instructions.

C. Provide a competent, experienced foreman to supervise installation and coordinate final connections with Mechanical and Electrical Contractors.

D. KEC shall provide a qualified and capable crew to enable the equipment to be installed effectively and accurately without damage to floor and wall finishes. Surfaces shall be protected by carboard or other covering to protect finish from damage while installing equipment.

E. Cut neatly around obstructions to provide safe and sanitary conditions to include but not limited to utility rough-ins and structure such as columns.

F. Provide cut-outs in foodservice equipment where required to run plumbing, electric, beverage, or other necessary lines through equipment items for final connections.

G. Installation of remote refrigeration systems:
   1. All refrigeration work included in this contract shall be accomplished in a professional manner, using finest quality fittings, controls, valves, etc.
   2. Refrigeration equipment and systems shall be started, tested, adjusted as per the manufacturer's instructions, and turned over to the Owner in first class operating condition.
   3. Refrigeration lines and hook-ups shall be completed by the KEC, with the exception of electric final connections unless otherwise specified.
   4. All refrigerant lines in sleeves or conduit shall be effectively sealed at both ends and at penetrations through walls or floors including walk-in cooler and freezer walls.
   5. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers.
   6. Walk-in box ceiling support systems shall be installed by KEC as per manufacturer's instructions. Support blocking to be provided by General Contractor.
   7. Wrap drain line in freezer compartment(s) with heat-tape for final connection by Electrical Contractor.

H. Kitchen exhaust system installation:
   1. KEC is responsible for installation of exhaust canopies.
   2. KEC is responsible for installation of fire suppression system.
   3. Mechanical Contractor is responsible for installation of fans and ductwork.
   4. General Contractor is responsible for structural support.

I. Sealing and Caulking:
   1. Prior to application of sealant, all surfaces shall be thoroughly cleaned.
   2. Apply sealant at all permanent intersections of equipment with walls, floors, curbs, and other permanent equipment.
   3. Where gaps of 1/4" or less occur adjacent to or between equipment, insert tope backing and smoothly applied construction sealant of color to match equipment. Mask both sides of gap for neat application of sealant and remove excess.
   4. If gaps exceed 1/4" install 18-gauge stainless steel trim of proper shape with concealed attachment.

J. Protect equipment from damage:
   1. Once installed cover equipment with appropriate material to protect from damage for duration of construction.
   2. The equipment is prohibited from use by all contractors as a work bench, storage area, table, ladder, etc.

K. Repair of damage caused by this contractor will be the responsibility of this contractor at no expense to the Owner. Report any damage discovered to the G/C, Architect, and Consultant and provide recommendation for remedy.

3.03 CLEAN AND ADJUST

A. Clean up and remove from the jobsite, all debris resulting from the work of this contractor as the installation progresses unless noted otherwise in the contract documents. Put and keep the site in a safe and broom-clean condition during installation.

B. Lubricate and adjust foodservice equipment hardware (ex. Drawer slides, hinges, casters, etc.) to level, square and ready for Owner's use.

C. Adjust pressure regulating valves, thermostatic controls, temperature sensors, etc. to manufacturer's recommended settings in preparation for Owner's use.

D. Equipment shall be left in a clean and usable condition.

3.04 START UP AND DEMONSTATION

A. KEC shall test and adjust all foodservice equipment per the manufacturer's instructions and confirm in writing to the Owner that the installation and performance are in full compliance.

B. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.

C. Provide an operating demonstration of al new equipment at a time of Owner's convenience. Schedule with Owner's representative a minimum of two weeks in advance and notify Architect and Consultant of schedule.

D. Demonstration of key appliances shall be performed by manufacturer's representative knowledgeable in all aspects of the equipment they represent. The owner's representative, Architect, or Consultant shall determine what are key appliances.

E. During the demonstration, instruct the Owner's representative(s) in the proper operation and maintenance of the equipment.

3.05 ITEMIZED EQUIPMENT SPECIFICATIONS AS FOLLOWS:

ITEM 1 - WORK TABLE, STAINLESS STEEL TOP (1 REQ'D)
Advance Tabco Model KMS-302 Dimensions: 40.5(h) x 24(w) x 30(d)
Work Table, 24"W x 30"D, 16 gauge 304 stainless steel top with 5"H backsplash, 18 gauge stainless steel adjustable undershelf, stainless steel legs & adjustable bullet feet, NSF

ITEM 2 - CONVECTION OVEN, GAS (RELOCATE EXISTING) (1 REQ'D)
Vulcan Model VC44GD
Convection Oven, gas, double-deck, standard depth
1 ea Natural gas
1 ea (2) 120v/60/1-ph, 15.4 amps total, (2) cords with plugs, standard

ITEM 2.1 - BLUE HOSE GAS CONNECTOR KIT (1 kt REQ'D)
Dormont Manufacturing Model 1675KIT2S48
Dormont Blue Hose™ Moveable Gas Connector Kit, 3/4" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled restraining cable with hardware, 160,000 BTU/hr minimum flow capacity, limited lifetime warranty

ITEM 3 - TILTING SKILLET BRAISING PAN, GAS (RELOCATE EXISTING) (1 REQ'D)
Cleveland Range Model SGL30T1
PowerPan™ Tilting Skillet, gas, 30-gallon capacity, bead blasted cooking surface, 10° tilt cooking feature, with easy manual hand tilt, spring-assisted cover with vent, gallon & liter markings, stainless steel construction with open leg frame, CE, NSF, 125,000 BTU
1 ea Natural Gas
1 ea 120v/60/1-ph, 1.4 amps, NEMA 5-15P, standard

ITEM 3.1 - BLUE HOSE GAS CONNECTOR KIT (RELOCATE EXISTING) (1 kt REQ'D)
Dormont Blue Hose™ Moveable Gas Connector Kit, 3/4" inside dia., 48" long

ITEM 3.2 - FLOOR TROUGH (1 REQ'D)
Advance Tabco Model FFTG-1224 Dimensions: 4(h) x 24(w) x 12(d)
Floor Trough, 24"W x 12"D x 4" deep, with fiberglass grating, stainless steel removable strainer basket, 4" O.D. waste pipe 3"L, pitched towards waste, NSF

ITEM 4 - KETTLE FILLER STANCHION (1 REQ'D)
T&S Brass Model B-0182
Kettle Filler Stanchion, 4" dia., with floor mounting flange, double-joint nozzle, 8' spray hose, hot/cold water valves, chrome-plated finish & base plate

ITEM 5 - RANGE, 36", 6 OPEN BURNERS (RELOCATE EXISTING) (1 REQ'D)
Restaurant Range, natural gas, 36", (6) 30,000 BTU burners, lift-off burner heads, standard oven, 6" adjustable legs, 215,000 BTU

ITEM 5.1 - BLUE HOSE GAS CONNECTOR KIT (1 kt REQ'D)
Dormont Manufacturing Model 16100KIT2S48
Dormont Blue Hose™ Moveable Gas Connector Kit, 1" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled restraining cable with hardware, 295,000 BTU/hr minimum flow capacity, limited lifetime warranty

ITEM 6 - WORK TABLE, STAINLESS STEEL TOP (1 REQ'D)
Advance Tabco Model FTS-3015-X Dimensions: 37(h) x 15(w) x 30(d)
Special Value Equipment Filler Table, 15"W x 30"D, 18 gauge 430 stainless steel, stainless steel undershelf & legs, adjustable plastic bullet feet, NSF

ITEM 7 - S/S WALL PANELS (1 lot REQ'D)
Custom S/S Wall Panels shall be:
1. 20-gauge material polished to #4 finish
2. Affix to wall with heat resistant adhesive, no visible fasteners allowed
3. Panels shall be 48” wide and installed with vertical seams
4. Continuous panels vertically, no exposed horizontal seams allowed
5. 120” End caps – J63-1451-10 Component Hardware Group, or equal
6. 120” Divider bars - J64-1450-10 Component Hardware Group, or equal
7. KEC to cut openings in panels for utilities as needed at time of install
8. Panels shall cover wall from top of cove base to ceiling. KEC refer to architectural plans for heights of both.

ITEM 8 - EXHAUST HOOD (1 REQ'D)
Captive-Aire
Kitchen exhaust hood. As per CaptiveAire drawing # 5752374 at the end of specifications.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 9 - EXHAUST FAN (BY M/C) (1 REQ'D)
Exhaust Fan, by M/C.

ITEM 10 - SUPPLY FAN (BY M/C) (1 REQ'D)
Supply Fan / Make up air unit, by M/C.

ITEM 11 - FIRE SUPPRESSION SYSTEM (1 REQ'D)
Captive-Aire
Fire suppression system. As per CaptiveAire drawing # 5752374 at the end of specifications.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 12 - CONTROLS AT EXHAUST HOOD (1 REQ'D)
Captive-Aire
Exhaust system electrical control package. As per CaptiveAire drawing # 5752374 at the end of specifications.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 13 - SPARE NO.

ITEM 14 - SPARE NO.

ITEM 15 - MILK COOLER (RELOCATE EXISTING) (1 REQ'D)
School Milk Cooler.
1 ea 115v/60/1-ph, 5.8 amps, cord with NEMA 5-15P

ITEM 16 - HOT FOOD SERVING COUNTER / TABLE (1 REQ'D)
Duke Manufacturing Model TEHF-60SS Dimensions: 36(h) x 60(w) x 32(d)
Thurmaduke™ Hot Food Unit, mobile, electric, 60"W x 32"D x 36"H, 16ga stainless steel top, (4) stainless steel heat wells, drains, copper manifolds, (1) valve, thermostats, dish shelf, 20ga stainless steel body & undershelf, 5" swivel casters & brakes, 6 ft cord with plug, cULus, UL EPH
1 ea Model TEHF60-208-1 208v/60/1-ph, 3600 watts, 17.3 amps
1 ea Model MOD-14-4 14ga stainless steel top, in lieu of standard
1 ea Model ILD Internal Locking Device (on both ends), stainless steel pin & latch line up device under countertop
1 ea Model P-LAM Veneer plastic laminate on body
1 ea Model MOD-4P Veneer on customer's side
2 ea Model MOD-P-END Veneer on end, each
1 ea Model SOLID-HD-4CU Tray Slide, customer's side, 60" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 32" high (special height)
1 ea Model VALVE-IND-4 Individual brass valves
1 ea Model MOD-SPH Special height unit - **34" H **
1 ea Model TS422-60 Contemporary Food Shield, 59-1/2"W x 19-1/2"D x 20-1/8"H, adjustable from full-service to self-service guard, single shelf, vertical fixed end closures, 1" dia. vertical stainless steel tube posts, stainless steel finish posts mounted through countertop with mounting flange, 3/8" glass over-shelf & guard with 1/4" glass ends (tempered and polished rounded edges)
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 17 - SERVING COUNTER, UTILITY (1 REQ'D)
Duke Manufacturing Model TST-60SS Dimensions: 36(h) x 60(w) x 32(d)
Thurmaduke™ Solid Top Unit, mobile utility counter, 60"W x 32"D x 36"H, 16ga stainless steel top, 20ga stainless steel body & undershelves, 5" dia. gray poly swivel casters & brakes, NSF
1 ea Model MOD-14-4 14ga stainless steel top, in lieu of standard
1 ea Model ILD Internal Locking Device (on both ends), stainless steel pin & latch line up device under countertop
1 ea Model P-LAM Veneer plastic laminate on body
1 ea Model MOD-4P Veneer on customer's side

2 ea Model MOD-P-END Veneer on end, each
1 ea Model SOLID-HD-4CU Tray Slide, customer's side, 60" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 32” high (special height)
1 ea Model MOD-SPH Special height unit - ** 34" H **
1 ea Model TS422-60 Contemporary Food Shield, 59-1/2"W x 19-1/2"D x 20-1/8"H, adjustable from full-service to self-service guard, single shelf, vertical fixed end closures, 1" dia. vertical stainless steel tube posts, stainless steel finish posts mounted through countertop with mounting flange, 3/8" glass over-shelf & guard with 1/4" glass ends (tempered and polished rounded edges)

**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 18 - SERVING COUNTER, COLD FOOD (1 REQ'D)

Duke Manufacturing Model TCM-74SS-N7 Dimensions: 36(h) x 74(w) x 32(d)
Thurmaduke™ Cold Food Unit, mobile, 74"W x 32"D x 36"H, 16ga stainless steel top, NSF 7 stainless steel mechanical cold pan, 8" deep, 70-1/2" x 21-3/4" liner, 1" drain line & valve, stainless steel body & undershelf, 5" dia. swivel casters & brakes, R448a, 120v/60/1-ph, 6.78 amps, NEMA 5-15P, cULus, UL EPH Classified

1 ea Model COND-EVAP Condensate evaporator
1 ea Model MOD-14-5 14ga stainless steel top, in lieu of standard
1 ea Model P-LAM Veneer plastic laminate on body
1 ea Model MOD-5P Veneer on customer's side
2 ea Model MOD-P-END Veneer on end, each
1 ea Model SOLID-HD-5CU Tray Slide, customer's side, 74" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 32" high (special height)
1 ea Model MOD-SPH Special height unit - ** 34" H **
1 ea Model TS422-74 Contemporary Food Shield, 73-1/2"W x 19-1/2"D x 20-1/8"H, adjustable from full-service to self-service guard, single shelf, vertical fixed end closures, 1" dia. vertical stainless steel tube posts, stainless steel finish posts mounted through countertop with mounting flange, 3/8" glass over-shelf & guard with 1/4" glass ends (tempered and polished rounded edges)

**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 19 - CASHIER STATION (RELOCATE EXISTING) (1 REQ'D)

Cashier Station, relocate existing.

ITEM 20 - SERVING COUNTER, UTILITY (1 REQ'D)

Duke Manufacturing Model TST-60SS Dimensions: 36(h) x 60(w) x 32(d)
Thurmaduke™ Solid Top Unit, mobile utility counter, 60"W x 32"D x 36"H, 16ga stainless steel top, 20ga stainless steel body & undershelves, 5" dia. gray poly swivel casters & brakes, NSF

1 ea Model MOD-14-4 14ga stainless steel top, in lieu of standard
1 ea Model P-LAM Veneer plastic laminate on body
1 ea Model MOD-4P Veneer on customer's side
2 ea Model MOD-P-END Veneer on end, each
1 ea Model MOD-4P-D Veneer on door
1 ea Model SOLID-HD-4CU Tray Slide, customer's side, 60" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 32" high (special height)
1 ea Model SOLID-HD-4OP Tray Slide, operator's side, 60" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 32" high (special height)

1 ea Model MOD-SPH Special height unit – 34” high
1 ea Model 329-4SS Sliding doors, 17" high, 60" long, double-wall stainless steel, operate on ball-bearing wheels on overhead tracks, for Solid Top, Urn Stand & 5" Deep Ice Cooled Cold Pan Units with (3) wells, NSF, UL, UL EPH Classified
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 21 - MOBILE HEATED CABINET (1 REQ'D)
Metro Model C539-HFC-U Dimensions: 71(h) x 27.63(w) x 31.5(d)
C5™ 3 Series Heated Holding Cabinet, with Red Insulation Armour™, mobile, full height, insulated, clear polycarbonate door, removable bottom mount control module, thermostat to 200°F, universal wire slides on 3" centers, adjustable on 1-1/2" increments (18) 18" x 26" or (34) 12" x 20" x 2-1/2" pan capacity, 5" casters (2 with brakes), aluminum, 120v/60/1-ph, 2000 watts, 16.7 amps, NEMA 5-20P, cULus, NSF

ITEM 22 - WORK TABLE, STAINLESS STEEL TOP (1 REQ'D)
Advance Tabco Model KMS-308 Dimensions: 40.5(h) x 96(w) x 30(d)
Work Table, 96"W x 30"D, 16 gauge 304 stainless steel top with 5"H backsplash, 18 gauge stainless steel adjustable undershelf, stainless steel legs & adjustable bullet feet, NSF
2 ea Model SHD-2020 Drawer, 20"W x 20"D x 5" deep drawer pan insert, heavy duty, self-closing, stainless steel, NSF

ITEM 23 - S/S PASS SHELF (1 REQ'D)
Custom built S/S pass shelf.
16 gauge, 300 series stainless top, polished to #4 finish. Turn top down 1 ½” and provide hug edge full length and on open end. Overhang wall 1” on open end. Furnish with 1” riser at full height wall, verify wall thickness. Closed ends on partial ends at full height wall. Furnish with 2” x 2” SS support brackets on both sides for attachment to partial height wall.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 24 - SLICER W/ STAND (RELOCATE EXISTING) (1 REQ'D)
Slicer and equipment stand. Relocate Existing.

ITEM 25 - SPARE NO.

ITEM 26 - HAND SINK (2 REQ'D)
Advance Tabco Model 7-PS-70 Dimensions: 13(h) x 17.25(w) x 15.25(d)
Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, 4" OC splash faucet holes (no faucets), basket drain, wall bracket, NSF, cCSAus
2 ea T&S Brass Model B-1146-04 Workboard Faucet, wall mount, 4" centers, 5-3/4" swivel gooseneck nozzle, 2.2 GPM aerator, quarter-turn Eterna cartridges with spring checks, 4" wrist blade handles, 1/2" NPT male inlets, ADA Compliant
2 kt T&S Brass Model B-1100-K Installation Kit, for workboard wall mount faucets, (2) short EL's

ITEM 27 - WORK TABLE, STAINLESS STEEL TOP (1 REQ'D)
Advance Tabco Model TKMS-308 Dimensions: 40.5(h) x 96(w) x 30(d)
Work Table, 96"W x 30"D, 16 gauge 304 stainless steel top with 5"H backsplash, stainless steel legs with side & rear crossrails, adjustable stainless steel bullet feet, NSF
8 ft Model TA-11Z 5" Table Splash with 2" return for splash mounted faucet
1 ea Model TA-12 Countertop edge, front and both ends
1 ea Model TA-11C-2 Double Sink Welded Into Table Top, 20"W x 20"D x 8" deep bowls, includes faucet, NSF, sink position as per plan view
1 ea Model K-53OMIT To Delete Faucet
1 ea Model K-4 Support Bracket, for lever waste drain handle, (1) support required for each lever drain, installed on RH sink
1 ea Model K-15 Lever Waste Drain, twist handle operated with built in overflow, fits 3-1/2" drain opening, 2" NPT & 1-1/2" IPS outlet connections, installed on RH sink
1 ea Model K-37 Anti-Siphon vacuum breaker holes
1 ea Model K-453 Control Bracket, 14" x 16", position as per plan view
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 28 - WALL / SPLASH MOUNT FAUCET (1 REQ'D)
T&S Brass Model B-1128
Workboard Faucet, wall mount, 8" centers, 12" swivel/rigid spout, 2.2 GPM aerator, quarter-turn Eterna cartridges, lever handles, 1/2" NPT inlets, low lead, ADA Compliant
1 kt Model B-1100-K Installation Kit, for workboard wall mount faucets, (2) short EL's

ITEM 28.1 - DISPOSER (1 REQ'D)
InSinkErator Model SS-200-5-CC101
SS-200™ Complete Disposer Package, sink mount system, with #5 adaptor for 3.5" to 4" sink opening, 2 HP motor, stainless steel construction, includes syphon breaker, solenoid valve, flow control valve, programmable CC-101 control center, auto reversing, timed run, post flush, adjustable leg kit
1 ea Standard height disposer body
1 ea 208v/60/3-ph, 3.6 amps
1 ea Model SYPHON STD Syphon breaker standard, 1/2"

ITEM 29 - BUN / SHEET PAN RACK (RELOCATE EXISTING) (3 REQ'D)
Advance Tabco Model PR20-3K-X Dimensions: 69.25(h) x 20.25(w) x 26(d)
Special Value Rack, mobile pan, full height, open sides, with 1-1/2" ribbed angle, capacity 20 - 18" x 26" sheet pans, bolted extruded aluminum frame, front loading, 69-1/4" high, shipped knocked down

ITEM 30 - REACH-IN REFRIGERATOR (RELOCATE EXISTING) (1 REQ'D)
True Mfg. - General Foodservice Model TS-49-HC Dimensions: 78.38(h) x 54.13(w) x 29.5(d)
Refrigerator, reach-in, two-section, 1/2 HP, 115v/60/1-ph, 9.2 amps, NEMA 5-15P

ITEM 31 - THREE (3) COMPARTMENT SINK (1 REQ'D)
Advance Tabco Model FC-3-2030-30RL Dimensions: 42(h) x 120(w) x 36(d)
Fabricated Sink, 3-compartment, 30" right & left drainboards, bowl size 20" x 30" x 14" deep, 16 gauge 304 stainless steel, tile edge splash, rolled edge, 8" OC faucet holes, stainless steel legs with adjustable side cross-bracing, 1" adjustable stainless steel bullet feet, overall 36" F/B x 120" L/R, NSF
3 ea Model K-5 Drain, twist operated, 2" NPT & 1-1/2" IPS outlet connections
3 ea Model K-4 Support Bracket, for lever waste drain handle

ITEM 32 - WALL / SPLASH MOUNT FAUCET (2 REQ'D)
T&S Brass Model B-1128
Workboard Faucet, wall mount, 8" centers, 12" swivel/rigid spout, 2.2 GPM aerator, quarter-turn Eterna cartridges, lever handles, 1/2" NPT inlets, low lead, ADA Compliant
2 kt Model B-1100-K Installation Kit, for workboard wall mount faucets, (2) short EL's

ITEM 33 - POT RACK (1 REQ'D)
Advance Tabco Model SW-96 Dimensions: 12(h) x 96(w) x 12(d)
Pot Rack, wall-mounted, double bar design, 96"W x 12"D, constructed of 1/4" x 2" stainless steel, includes: (18) plated double pot hooks, NSF

ITEM 34 - GREASE INTERCEPTOR (BY P/C) (1 REQ'D)
Grease Interceptor. Provided and installed by P/C.

ITEM 35 - SPARE NO.

ITEM 36 - DISHTABLE, CLEAN (1 REQ'D)
Custom built clean dish table as per plan,
14-gauge 18-8 stainless steel top, type 304 stainless, polish to #4 finish,
1" x 4" x 1" SS channel bracing fastened to top, exposed ends capped,
Sound deaden top,
13" high splash at wall, 2" thick with 45 degree return to wall and 1" turn down,
3" high x 1 1/2" diameter raised rolled edge front and end opposite dish machine,
1 5/8" dia stainless steel legs and crossrails,
SS adjustable feet,
16 gauge 300 series under shelf as per plan welded to legs,
2” high rear splash on undershelf,
Weld booster heater slide brackets to dish table, position as per plan,
"Z" clip dish table to wall,
Slope dish table to dish machine,
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 37 - SHELVING, WALL MOUNTED (1 REQ'D)
Advance Tabco Model WS-12-60-X Dimensions: 10.5(h) x 60(w) x 12(d)
Special Value Shelf, wall-mounted, 60"W x 12"D, 1-5/8" bullnose front edge, 1-1/2"H rear up-turn, 18/430 satin finish stainless steel, NSF

ITEM 38 - BOOSTER HEATER, ELECTRIC (1 REQ'D)
Hatco Model C-12 Dimensions: 19.75(h) x 13(w) x 20.75(d)
Compact Booster Heater, Electric, 6-gallon storage capacity, electric operation, stainless steel front panel, powder-coated silver-gray hammertone body, 6" plastic non-adjustable legs, Castone® lined tank, 12kW, NSF, cULus, Made in USA
1 ea One year parts & labor warranty, ten year warranty on Castone tank, standard
1 ea 208v/60/3-ph, 33.4 amps
1 ea Model QSBOOSTERBRKT, slide brackets (to be mounted to clean dish table)

ITEM 39 - DISHWASHER, DOOR TYPE (BY OWNER'S VENDOR) (1 REQ'D)
Ecolab Model ES-2000
Ecolab Dishwasher, low-temperature sanitizing. 115v/60Hz/1 Ph/ 12amps. NIC, by owner’s vendor.

ITEM 40 - CONDENSATE EXHAUST HOOD (1 REQ'D)
Captive-Aire
Condensate Exhaust Hood. As per CaptiveAire drawing # 5752374 at the end of specifications.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 41 - CONDENSATE EXHAUST FAN (BY M/C) (1 REQ'D)
Condensate Exhaust Fan, by M/C.

ITEM 42 - DISHTABLE, SOILED "L" SHAPED (1 REQ'D)
Custom built "L" shape soiled dish table as per plan,
14-gauge 18-8 stainless steel top, type 304 stainless, polish to #4 finish,
1" x 4" x 1" channel bracing fastened to top, exposed ends capped,
Sound deaden top,
13" high splash at wall, 2" thick with 45 degree return to wall and 1" turn down,
Provide holes in top for scrap sink faucet item 44,
Provide holes in splash for pre-rinse faucet Item 43,
Provide holes in splash for vacuum breaker on disposer Item 45,
3" high x 1 1/2" diameter raised rolled edge on front,
Integral single compartment sink, as shown on plan, 20" x 16" x 12" with removable perforated scrap basket,
Provide and install 18" diameter disposer cone, position as shown on plan view,
Provide SS bracket for mounting of disposer controls,
1 5/8" dia stainless steel legs and crossrails,
SS adjustable feet,
Include welded field joint, indicate position on submittal drawings,
"Z" clip dish table to wall,
Slope dish table to dish machine,
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 43 - PRE-RINSE FAUCET ASSEMBLY (1 REQ'D)
T&S Brass Model B-0133-B
Pre-Rinse Unit, wall mount. base faucet with spring check cart. & lever handles, 2" dia. flanges with 1/2" NPT female eccentric flanged inlets, 35-1/2"H, 15" overhang, 8-1/4" clearance, 18" riser, (B-0107) spray valve, B-0044-H flex stainless steel hose, 6" wall bracket, quarter-turn Eterna cartridges, low lead

ITEM 44 - DECK MOUNT FAUCET (1 REQ'D)
T&S Brass Model B-1122
Faucet, 10" swing nozzle, deck mounted, quarter-turn Eterna cartridges, lever handles, low lead, ADA Compliant

ITEM 45 - DISPOSER (1 REQ'D)
InSinkErator Model SS-200-18A-CC101
SS-200™ Complete Disposer Package, with 18" diameter bowl, 6-5/8" diameter inlet, with removable splash baffle & reversible bowl cover, 2 HP motor, stainless steel construction, includes syphon breaker, solenoid valve, flow control valve, programmable CC-101 control center, auto reversing, timed run, post flush, adjustable leg kit
1 ea Standard height disposer body
1 ea 208v/60/3-ph, 3.6 amps
1 ea Model SYPHON STD Syphon breaker standard, 1/2"

ITEM 46 - DISHTABLE SORTING SHELF (1 REQ'D)
Advance Tabco Model DT-6R-12 Dimensions: 15.38(h) x 42(w) x 15.5(d)
Sorting Shelf, wall mounted, traditional design, 42"W, accommodates (2) full size dish racks, solid end brackets, stainless steel, NSF

ITEM 47 - S/S WALL PANELS @ DISH (1 lot REQ'D)
Custom S/S Wall Panels shall be:
1. 20-gauge material polished to #4 finish
2. Affix to wall with heat resistant adhesive, no visible fasteners allowed
3. Panels shall be 48” wide and installed with vertical seams
4. Continuous panels vertically, no exposed horizontal seams allowed
5. 120” End caps – J63-1451-10 Component Hardware Group, or equal
6. 120” Divider bars - J64-1450-10 Component Hardware Group, or equal
7. KEC to cut openings in panels for utilities as needed at time of install
8. Panels shall cover wall from top of cove base to ceiling. KEC refer to architectural plans for heights of both.

ITEM 48 - COMMERCIAL WASTE CONTAINER (BY OWNER) (3 REQ'D)
Waste Container, 44 gallon, by Owner.

ITEM 49 - TABLE / TRAY CART (RELOCATE EXISTING) (2 REQ'D)
Mobile table / tray cart. Relocate existing.

ITEM 50 - RACK DOLLY (2 REQ'D)
Cambro Model CDR2020151 Dimensions: 8(h) x 21.38(w) x 21.38(d)
Camdolly® for Camracks, 21-3/8"L x 21-3/8"W x 8"H (exterior dimensions), without handle, platform design, (4) swivel 3-1/2" casters, no brakes, lightweight, durable, soft gray polypropylene

ITEM 51 - PLASTIC SHELVING UNIT (1 REQ'D)
Cambro Model ESU244872V4580 Dimensions: 72(h) x 48(w) x 24(d)
Camshelving® Elements Stationary Starter Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

ITEM 52 - SPARE NO.

ITEM 53 - SPARE NO.

ITEM 54 - MOP SINK (1 REQ'D)
Advance Tabco Model 9-OP-20
Mop sink, floor mounted
Furnished with splash guards back and right, model K-288R
Furnished with service faucet, model K-240

ITEM 55 - SHELVING, WALL MOUNTED (1 REQ'D)
Advance Tabco Model K-245 Dimensions: 7.5(h) x 24(w) x 8(d)
Utility Shelf, wall-mounted, 24"W x 8"D, 1-1/2" upturn on rear & sides, stainless steel, NSF

ITEM 56 - MOP BUCKET WRINGER (BY OWNER) (1 REQ'D)
Mop bucket and wringer, by Owner.

ITEM 57 - PLASTIC SHELVING UNIT (2 REQ'D)
Cambro Model ESU244872V4580 Dimensions: 72(h) x 48(w) x 24(d)
Camshelving® Elements Stationary Starter Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

6 ea Model EA244872V4580 Camshelving® Elements Stationary Add-On Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (2) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), brushed graphite, 800 lbs. capacity per shelf /2,000 lbs. max capacity, NSF

1 ea Lifetime warranty against corrosion and rust

ITEM 58 - WALK-IN FREEZER (1 REQ'D)
Kolpak Walk-in Freezer, as per plan and as per Kolpak specification at the end of this section.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 59 - REFRIGERATION SYSTEM AT WALK-IN FREEZER (1 REQ'D)
Kolpak Refrigeration system at walk-in freezer. As per Kolpak specification at the end of this section.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 60 - DUNNAGE RACK (2 REQ'D)
New Age Model 2054 Dimensions: 12(h) x 42(w) x 20(d)
Dunnage Rack, 42"W x 20"D x 12"H, all welded aluminum construction, 1-1/2" x 1-3/4" x 0.070 tubing, welded aluminum caps on feet, weight capacity 3000 lbs., NSF, Made in USA

2 ea Lifetime warranty against rust & corrosion, 5 year workmanship and material defects warranty, standard

ITEM 61 - PLASTIC SHELVING UNIT (1 REQ'D)
Cambro Model ESU246072V4580 Dimensions: 72(h) x 60(w) x 24(d)
Camshelving® Elements Stationary Starter Unit, 24"W x 60"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

2 ea Model EA246072V4580 Camshelving® Elements Stationary Add-On Unit, 24"W x 60"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (2) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

1 ea Model ESU244872V4580 Camshelving® Elements Stationary Starter Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors &

wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

2 ea Model EA244872V4580 Camshelving® Elements Stationary Add-On Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (2) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), brushed graphite, 800 lbs. capacity per shelf /2,000 lbs. max capacity, NSF

1 ea Lifetime warranty against corrosion and rust

ITEM 62 - WALK-IN COOLER (1 REQ'D)

Kolpak Walk-in Cooler as per plan and as per Kolpak specification at the end of this section.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 63 - REFRIGERATION SYSTEM AT WALK-IN COOLER (1 REQ'D)

Kolpak Refrigeration system at walk-in Cooler. As per Kolpak specification at the end of this section.
**PROVIDE DRAWING FOR APPROVAL PRIOR TO FABRICATION

ITEM 64 - PLASTIC SHELVING UNIT (2 REQ'D)

Cambro Model ESU244872V4580 Dimensions: 72(h) x 48(w) x 24(d)
Camshelving® Elements Stationary Starter Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (4) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), 800 lbs. capacity per shelf /2,000 lbs. max capacity, brushed graphite, NSF

4 ea Model EA244872V4580 Camshelving® Elements Stationary Add-On Unit, 24"W x 48"L x 72"H, 4-tier, withstands temperature from -36°F (-38°C) to 190°F (88°C), includes: (4) vented reinforced polypropylene shelf plates with Camguard® antimicrobial protection, (2) composite posts with leveling feet installed, pre-assembled post connectors & wedges, (8) stationary traverses & (4) bags of 8 count dovetails (16 each A & B), brushed graphite, 800 lbs. capacity per shelf /2,000 lbs. max capacity, NSF

1 ea Lifetime warranty against corrosion and rust

KOLPAK
A Welbilt Brand

A Division of Manitowoc FSG Operations, LLC

Date: 1/4/2023

Project: Willow Lake School #58

Item	Qty	Item Description
1	1	**Freezer**

Compartments:

Freezer -10*

Interior Dimensions: 8'-6" x 15'-2" x 8'-2 1/4"

Walls: 4" Class 1 - Foamed in place Urethane

Exterior: Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

Ceiling: 4" Class 1 - Foamed in place Urethane

Type: Standard

Attachment: Lock Down

Exterior: Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

Floor Application: Screed, Vinyl 4" x 4" High

Compartment Accessories:

Qty	UoM	Description
2	ea	Trim Angled 3" x 3" x 8ft Galvalume Embossed 26 ga
2	ea	Light - LED 48IN 120/230V 50/60HZ

Refrigeration:

Qty	UoM	Description
1	ea	KPC249LZOP-3EP PC249LZOP-3EP, 208-230/60/3, 2-1/2HP, R404A, Pre-Charged, Air-Cooled, Scroll, Low Temp Standard Plus Compressor Unit, Amps: 12.3, Ambient Temperature: 99 Includes Head Pressure Control Valve (Headmaster), Amps: 12.3, Ambient Temperature: 99
1	ea	KEL26-090-2ECAFOEM-PR-4 EL26-090-2ECAFOEM-PR-4, 208-230/60/1, R404A, Low Temp, Electric Defrost, Standard Unit Cooler, Tru-Dmnd™ by ArcticFox™, Amps: 9.8

One year parts and labor included

Refrigeration Accessories:

Qty	UoM	Description

Doors/Openings:

Door: 34" x 78" Right Swing Out
Recessed 0" with 0" Leveling Sand and 0" Tile & Grout.

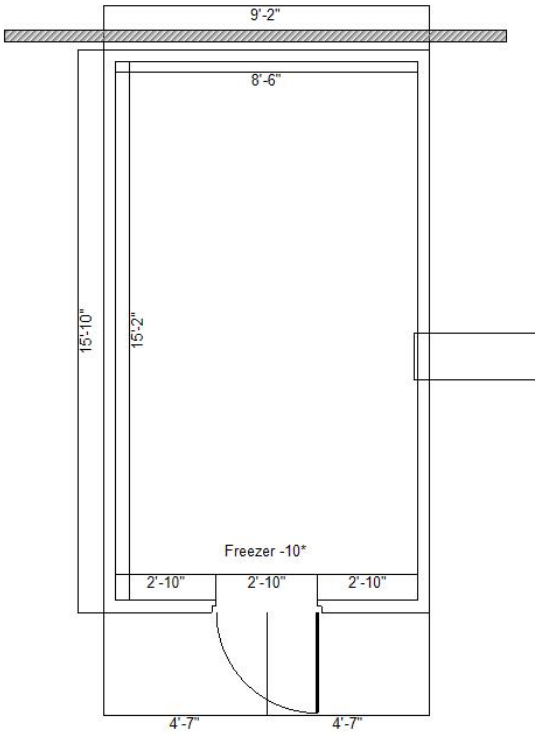
Frame: **Exterior:** Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

Plug: **Exterior:** Galvalume - Embossed 26 Ga Kickplate, Alum .063 Diamond Tread 36" High
Interior: Galvalume - Embossed 26 Ga Kickplate, Alum .063 Diamond Tread 36" High

Door/Opening Accessories:

Qty	UoM	Description
1	ea	Handle - Kason 27C Brushed Chrome
1	ea	Door Closer - Kason 1094 (STD)
1	ea	Alarm - Alarmpak 110V F/C XWA11V Weiss (Weatherproof STD)
1	ea	Vent - Pressure Relief, Heated Kason 1825 (STD)
1	ea	Thru Ceiling Electrical (All Conduit Concealed)
1	ea	Light Centered Over Door Opening
2.83	lf	Threshold, Stainless Steel 14 ga
1	ea	Heater Wire, 5 Watt / FT
3	ea	Hinge - Kason 1346 Brushed Chrome Adjustable / Spring Assisted (STD)
1	ea	Light Fixture - Kason 1803 LED w/Bulb, Globe & Nightlight 120V (STD)



KOLPAK
A Welbilt Brand

A Division of Manitowoc FSG Operations, LLC

Date: 1/4/2023

Project: Willow Lake School #62

Item	Qty	Item Description
1	1	**Cooler**

Compartments:

Cooler +35*

Interior Dimensions: 8'-4" x 11'-10 1/2" x 8'-2 1/4"

Walls: 4" Class 1 - Foamed in place Urethane

Exterior: Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

Ceiling: 4" Class 1 - Foamed in place Urethane

Type: Standard

Attachment: Lock Down

Exterior: Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

Floor Application: Screed, Vinyl 4" x 4" High

Compartment Accessories:

Qty	UoM	Description
3	ea	Trim Angled 3" x 3" x 8ft Galvalume Embossed 26 ga
2	ea	Light - LED 48IN 120/230V 50/60HZ

Refrigeration:

Qty	UoM	Description
1	ea	KPC69MZOP-2EP PC69MZOP-2EP, 208-230/60/1, 3/4HP, R404A, Pre-Charged, Air-Cooled, Scroll Medium Temp Standard Plus Compressor Unit, Amps: 7, Ambient Temperature: 99 Includes Head Pressure Control Valve (Headmaster), Amps: 7, Ambient Temperature: 99
1	ea	KAM26-094-1ECAFOEM-PR-4 AM26-094-1ECAFOEM-PR-4, 115/60/1, R404A, Medium Temp, Air Defrost, Standard Unit Cooler, Tru-Dmnd™ by ArcticFox™, Amps: 1.6

One year parts and labor included

Refrigeration Accessories:

Qty	UoM	Description

Doors/Openings:

Door: 34" x 78" Right Swing Out
Recessed 0" with 0" Leveling Sand and 0" Tile & Grout.

Frame: **Exterior:** Galvalume - Embossed 26 Ga

Interior: Galvalume - Embossed 26 Ga

KOLPAK
A Welbilt Brand

A Division of Manitowoc FSG Operations, LLC

Date: 1/4/2023

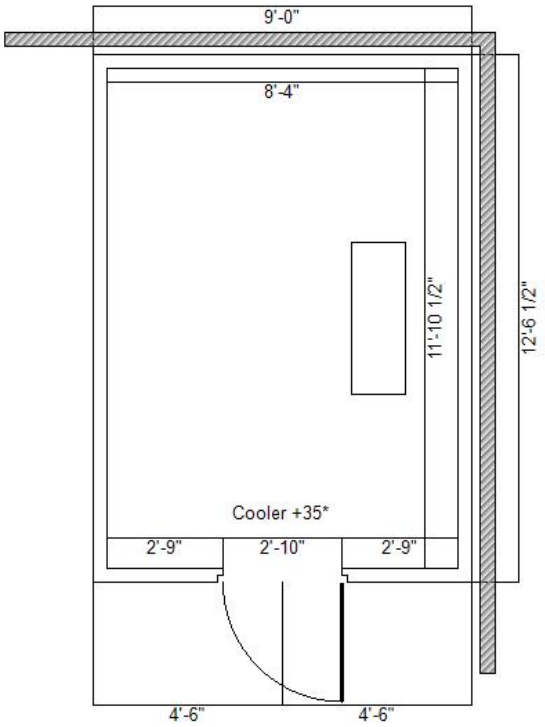
Project: Willow Lake School #62

Plug: **Exterior:** Galvalume - Embossed 26 Ga Kickplate, Alum .063 Diamond Tread 36" High

Interior: Galvalume - Embossed 26 Ga Kickplate, Alum .063 Diamond Tread 36" High

Door/Opening Accessories:

Qty	UoM	Description
1	ea	Handle - Kason 27C Brushed Chrome
1	ea	Door Closer - Kason 1094 (STD)
1	ea	Alarm - Alarmpak 110V F/C XWA11V Weiss (Weatherproof STD)
1	ea	Thru Ceiling Electrical (All Conduit Concealed)
1	ea	Light Centered Over Door Opening
3	ea	Hinge - Kason 1346 Brushed Chrome Adjustable / Spring Assisted (STD)
1	ea	Light Fixture - Kason 1803 LED w/Bulb, Globe & Nightlight 120V (STD)



FOR QUESTIONS, CALL THE
Minnesota Office
REGION 75
PHONE: (763) 432-5354
EMAIL: reg75@captiveaire.com

PATENT NUMBERS

EXHAUST HOODS ND-2/BD-2/SND-2 (CANADA) - CA PATENT 2520435 C.

HOOD INFORMATION – JOB#5752374

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S) WIDTH	LENG	HEIGHT	DIA	CFM	VEL	SP	HOOD CONSTRUCTION	HOOD CONFIG END TO END	ROW
1	#8	6024 ND-2	CAPTIVEAIRE	11' 9"	600 DEG	I	HEAVY	217	2550			4"	16"	2550	1826	-0.926"	430 SS WHERE EXPOSED	ALONE	ALONE
2	#40	4824 VHB-G	CAPTIVEAIRE	4' 0"	700 DEG	II	N/A	150	600			4"	10"	600	1100	-0.090"	430 SS 100%	ALONE	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S) TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	LIGHT(S) QTY	TYPE	WIRE GUARD	LOCATION	SIZE	UTILITY CABINET(S) FIRE SYSTEM TYPE	SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WEIGHT
1	#8	CAPTRATE SOLO FILTER	8	20"	16"	85% SEE FILTER SPEC	5	RECESSED ROUND	NO	RIGHT	12"x60"x24"	TANK FS	4.0/4.0	DCV-1111	1 LIGHT 1 FAN	YES	841 LBS
2	#40						0									NO	156 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	#8	RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		INSULATION FOR BACK OF HOOD.

HOODS ARE
BUILT IN COMPLIANCE WITH
UL 710 AND NFPA 96
AND ARE RECOGNIZED BY ONE
OR MORE OF THE FOLLOWING:

ETL SANITATION LISTED

ETL LISTED FILE# 3054804-001

GENERAL NOTES

INSTALLATION

ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.

ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.

ALL CONNECTIONS FROM CAPTIVE-AIRE DUCT PER MECHANICAL CONTRACTORS'S PLANS.

COOKING EQUIPMENT TO SHUTOFF IN EVENT OF FIRE.

EXHAUST FANS TO TURN ON IN EVENT OF FIRE.

ALL LIGHTS FIXTURE SHOWN INSTALLED BY CAPTIVE-AIRE ARE FACTORY PREWIRED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES BY ELECTRICAL CONTRACTORS.

LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.

SEISMIC RESTAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.

INSTALLING CONTRACTORS ASSUME ALL RELATED REPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION, AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

ALL WALLS THAT COME WITHIN 18" OF HOOD MUST BE METAL STUDS. WOOD STUDS NOT ALLOWED

GREASE DUCTS SERVING TYPE I HOODS SHALL BE CONSTRUCTED OF STEEL NOT LESS THAN 0.055 INCH (1.4MM) (NO. 16 GAGE) IN THICKNESS OR STAINLESS STEEL NOT LESS THAN 0.044 INCH (1.1MM) (NO. 18 GAGE) IN THICKNESS. **EXCEPTION:** LISTED & LABELED FACTORY BUILT KITCHEN GREASE DUCTS SHALL BE INSTALLED IN ACCORDANCE WITH IMC SECTION 304.1

BALANCE

KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.

KITCHEN SHALL BE SLIGHT NEGATIVE WITH RESPECT TO DINING AREA.

RESTAURANT SHALL BE SLIGHT POSITIVE WITH RESPECT TO AMBIENT PRESSURE.

ADDITIONAL

WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.

SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

SPECIFICATION: CAPTRATE® GREASE-STOP® SOLO FILTER

THE CAPTRATE GREASE-STOP SOLO FILTER IS A SINGLE-STAGE FILTER FEATURING A UNIQUE S-BAFFLE DESIGN IN CONJUNCTION WITH A SLOTTED REAR BAFFLE DESIGN, TO DELIVER EXCEPTIONAL FILTRATION EFFICIENCY.

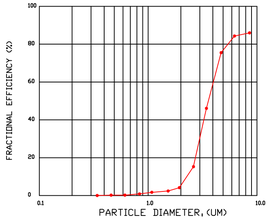
FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNEL(S).

UNITS SHALL INCLUDE STAINLESS STEEL HANDLES AND A FASTENING DEVICE TO SECURE THE TWO COMPONENTS WHEN ASSEMBLED.

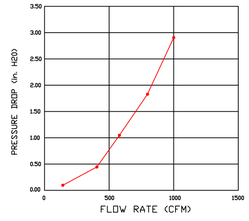
GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 85% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 1.0 INCHES OF WATER GAUGE.

THE CAPTRATE GREASE-STOP SOLO WAS TESTED TO ASTM STANDARD ASTM F2519-05. MANUFACTURER APPROVED FOR USE IN SOLID FUEL APPLICATIONS AS A SPARK ARRESTER.

EFFICIENCY VS. PARTICLE DIAMETER

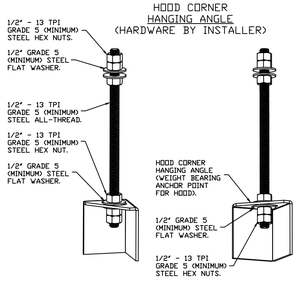


PRESSURE DROP VS. FLOW RATE



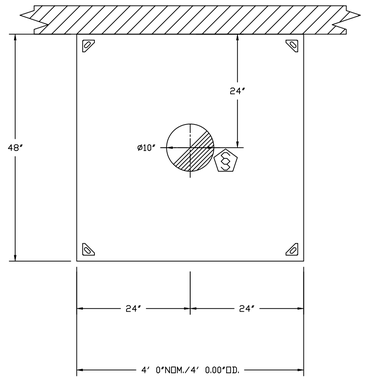
CAPTRATE FILTERS ARE BUILT IN COMPLIANCE WITH:
NFPA #96.
NSF STANDARD #2.
UL STANDARD #1046.
INT. MECH. CODE (IMC).
ULC-S649.

HOOD CORNER
HANGING ANGLE
(HARDWARE BY INSTALLER)

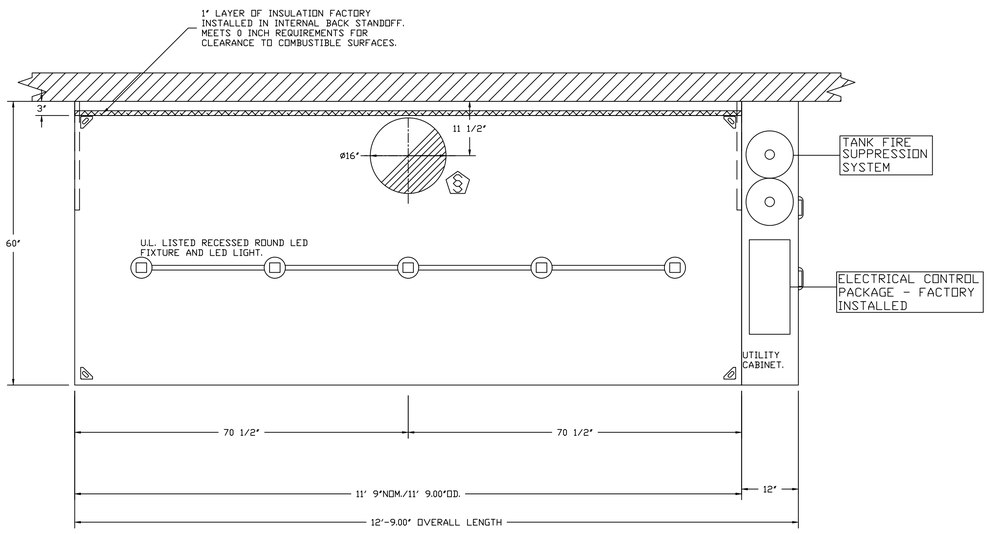


ASSEMBLY INSTRUCTIONS

HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 (MINIMUM) ALL-THREAD. SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 (MINIMUM) STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 (MINIMUM) HEX NUTS AS SHOWN. MUST USE DOUBLED HEX NUT CONFIGURATION BENEATH HOOD HANGING ANGLES AND ABOVE CEILING ANCHORS. MAINTAIN 1/4" OF EXPOSED THREADS BENEATH BOTTOM HEX NUT. TORQUE ALL HEX NUTS TO 57 FT-LBS.



PLAN VIEW – HOOD #2 (#40)
4' 0.00" LONG 4824VHB-G



PLAN VIEW – HOOD #1 (#8)
11' 9.00" LONG 6024ND-2

COMPLETE INSTALLATION OPERATION & MAINTENANCE MANUALS CAN BE DOWNLOADED FROM CAPTIVE AIRE'S WEBSITE: www.captiveaire.com

These products and others are available for demonstration at the Minneapolis, MN display center
FOR QUESTIONS OR FURTHER INFORMATION, CONTACT
CAPTIVE AIRE – REGION 75 – VENPRO OFFICE
@ PHONE 877-881-7582 OR FAX 919-747-5666
14505 21st AVE. N. SUITE 222
PLYMOUTH, MN 55441
REG75@CAPTIVEAIRE.COM
PRODUCTION WILL BEGIN ONCE APPROVED DRAWINGS ARE RECEIVED.

Please confirm accuracy of submittals, shipping information and jobsite readiness PRIOR to release. NO changes or cancellation will be allowed once order is submitted for production.

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted ☐
Approved with NO Exception Taken ☐
Revise and Resubmit ☐
SIGNATURE _____
Your Title _____ Date _____

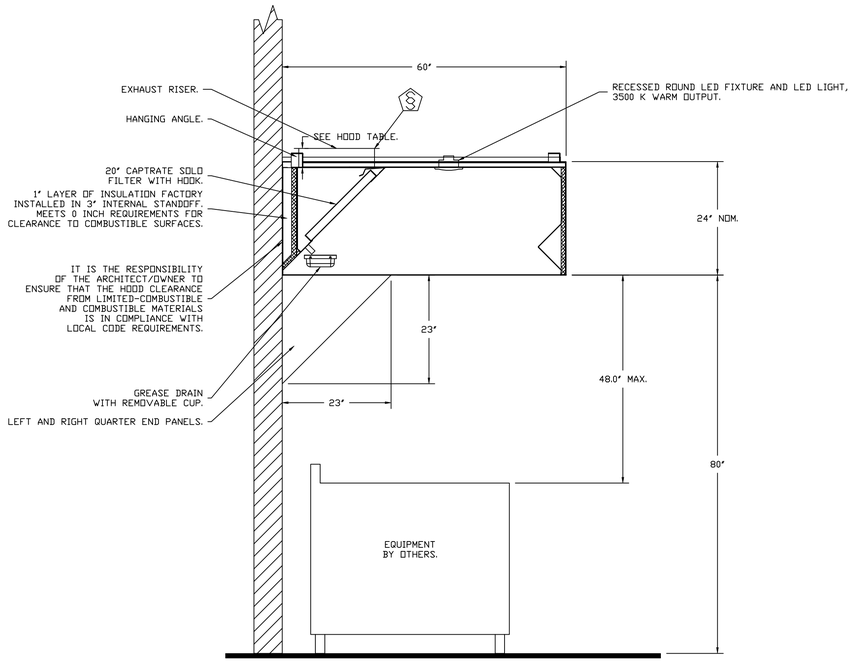
REVISIONS

	DESCRIPTION	DATE:
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△		
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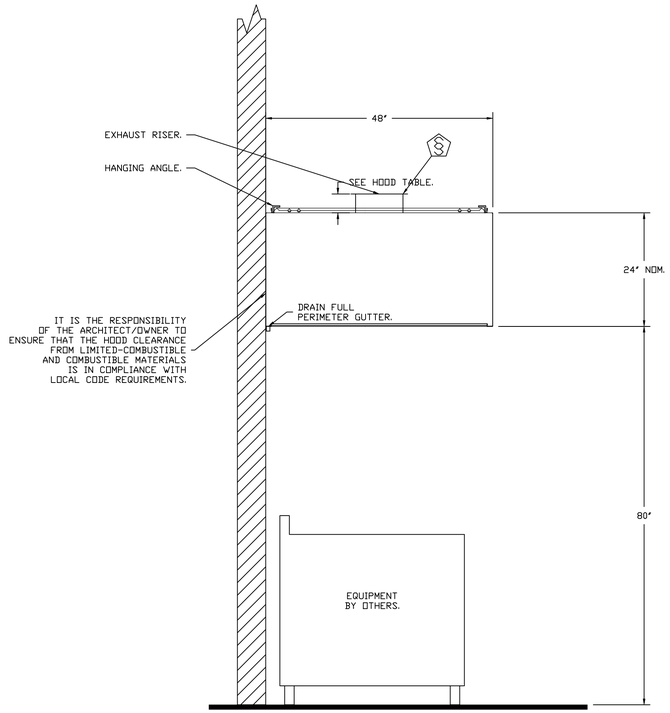
CAPTIVE-AIRE
www.captiveaire.com
Minnesota Office
14505 21st Ave. N., Suite 222, Plymouth, MN, 55447 PHONE: (763) 432-5354 FAX: (919) 747-5666 EMAIL: reg75@captiveaire.com

Willow Lake School
WILLOW LAKE, SD, 57278

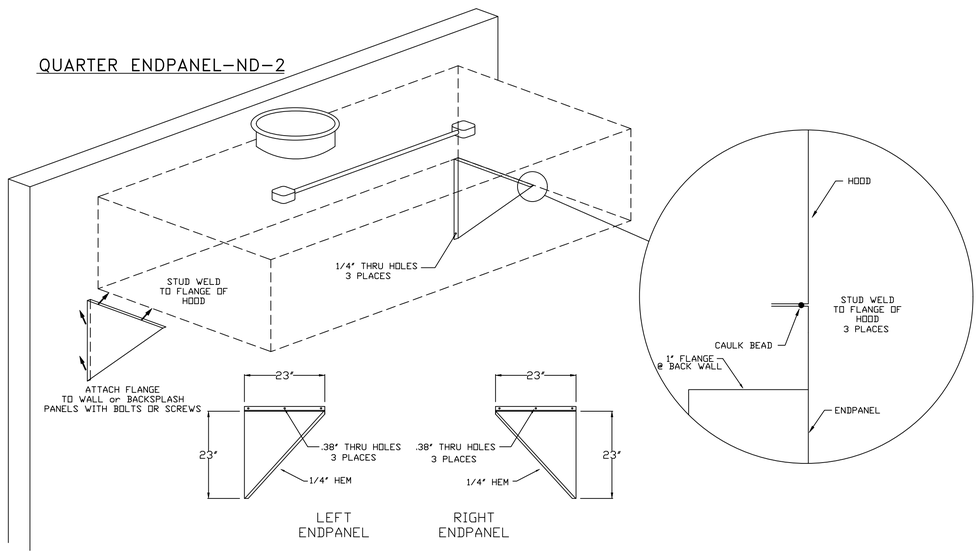
DATE: 1/26/2023
DWG.#: 5752374
DRAWN BY: CAH_75
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 1



SECTION VIEW – MODEL 6024ND–2
HOOD – #1 (#8)



SECTION VIEW – MODEL 4824VHB–C
HOOD – #2 (#40)



COMPLETE INSTALLATION OPERATION & MAINTENANCE MANUALS CAN BE DOWNLOADED FROM CAPTIVE AIRE'S WEBSITE: www.captiveaire.com

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Approved as Noted ☐
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Revise and Resubmit ☐
SIGNATURE _____
Your Title _____ Date _____

REVISIONS

	DESCRIPTION	DATE:
△		
△		
△		
△		

CAPTIVE AIRE
Minnesota Office
14505 21st Ave. N., Suite 222, Plymouth, MN, 55447 PHONE: (763) 432-5354 FAX: (919) 747-5666 EMAIL: reg75@captiveaire.com
www.captiveaire.com

Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023
DWG.#: 5752374
DRAWN BY: CAH_75
SCALE: 3/4" = 1'–0"
MASTER DRAWING

SHEET NO. 2

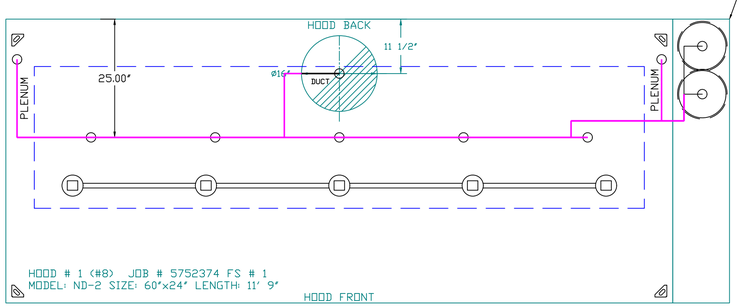
FIRE SYSTEM INFORMATION – JOB#5752374

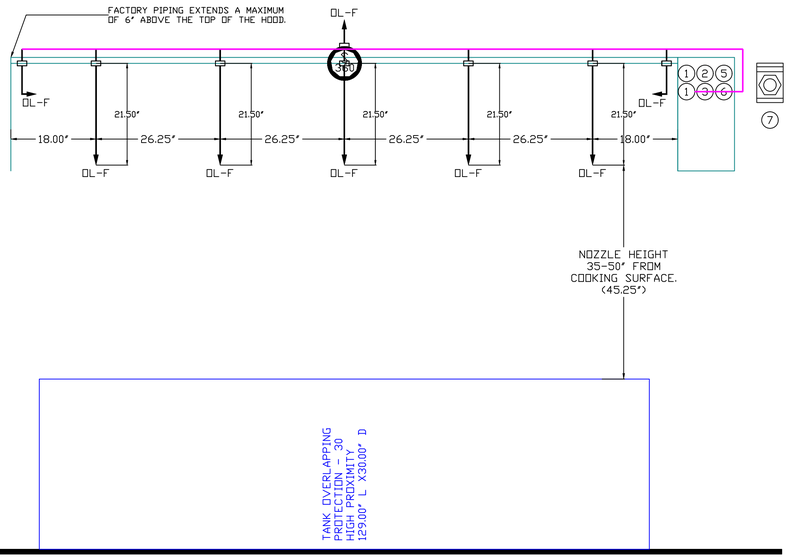
FIRE SYSTEM NO	TAG	TYPE	SIZE	FLOW POINTS	INSTALLATION	
					SYSTEM	LOCATION ON HOOD
1	#11	TANK FS	4.0/4.0	37	FIRE CABINET RIGHT	RIGHT, HOOD 1

GAS VALVE(S)

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1	#11	SC ELECTRICAL	0.750	CAPTIVEAIRE SYSTEMS

– SYSTEM REQUIRES A MINIMUM OF 7 FT OF EQUIVALENT PIPE LENGTH BETWEEN TANK AND NEAREST APPLIANCE NOZZLE FOR MOST APPLIANCES. EACH 90 DEGREE ELBOW ADDS 1.3 FT OF EQUIVALENT LENGTH. SEE MANUAL FOR DETAILS





NOTES
- FIELD PIPE DROPS AS SHOWN
  PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- FIELD INSTALLED DROP: FACTORY WILL PROVIDE QTY 2 60IN LONG PIECES OF CHROME PLATED PIPING SHIPPED LOOSE TO BE FIELD-INSTALLED.
- SHIP LOOSE DROP: FACTORY WILL PROVIDE THE EXACT CHROME PIPE LENGTH NEEDED SHIPPED LOOSE TO BE FIELD-INSTALLED.
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELVING, SALAMANDERS, ETC.
- OVERLAPPING COVERAGE SHALL NOT BE USED ON ANY APPLIANCE WITH AN OBSTRUCTION.
- IF APPLICABLE, EXTENDED PRE-PIPED DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6" ABOVE THE TOP OF THE HOOD.

- APPLIANCE DIMENSIONS LISTED REPRESENT THE COOKING SURFACE SIZE, NOT THE OVERALL APPLIANCE SIZE.

- THIS FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.

- OL-F NOZZLE PART NUMBER REPLACES 3070-3/8H-10-SS

JOB #: 5752374.
JOB NAME: WILLOW LAKE SCHOOL.

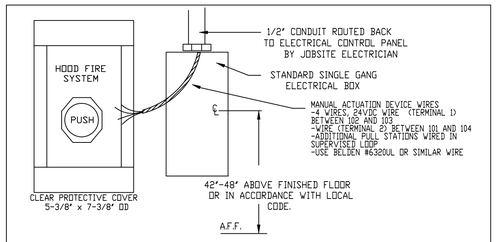
SYSTEM SIZE: TANK-SP-2 TOTAL FP REQUIRED: 37.
HOOD # 1 11' 9.00" LONG x 60" WIDE x 24" HIGH.
RISER # 1 SIZE: 16" DIA.
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.

- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

LEGEND – FIRE CABINET TANK SYSTEM

1 4 GALLON TANK.
2 PRIMARY ACTUATOR RELEASE.
3 SECONDARY ACTUATOR RELEASE.
4 PRESSURE SUPERVISION SWITCH.
5 PRIMARY HOSE ASSEMBLY.
6 SECONDARY HOSE ASSEMBLY.
7 REMOTE MANUAL ACTUATION DEVICE.

TANK MANUAL ACTIVATION STATION DETAIL



NOTE:
PULL STATION SHOULD BE ACCESSIBLE IN THE EVENT OF A FIRE, LOCATED IN A PATH OF EGRESS, AND CLEARLY IDENTIFY THE HAZARD PROTECTED

NOTE: ELECTRICAL CONTRACTOR TO FURNISH AND INSTALL A 2"X4"X2" SINGLE GANG BOX. BOX TO BE RECESSED IN SHEET ROCK 1/4".

GAS VALVES AND STRAINERS

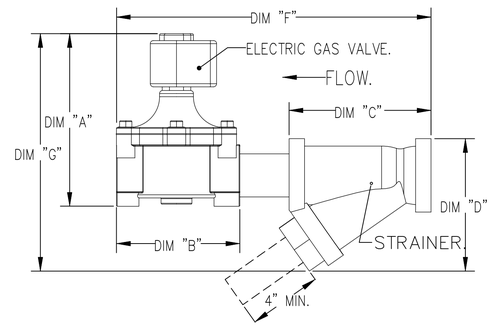
	GAS VALVE SIZING						GAS VALVE DIMENSIONS						INSTALLATION	PART NUMBERS		
	TYPE	SIZE	VOLTAGE	MIN. INLET PRESSURE	MAX. INLET PRESSURE	FLOW AT 1 IN.W.C. DROP NATURAL GAS	FLOW AT 1 IN.W.C. DROP PROPANE	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "F"	DIM "G"	MOUNTING ORIENTATION	GAS VALVE PART NUMBER	STRAINER PART NUMBER	GAS VALVE/STRAINER KIT
GAS VALVE FOR FS#1 →	ELECTRICAL	3/4"	120 VAC	0 PSI (0 IN.W.C.)	5 PSI (138 IN.W.C.)	593,200 BTU/HR	384,919 BTU/HR	6-15/16"	5-15/16"	4"	4-1/2"	11-15/16"	9-7/8"	HORIZONTAL/ VERTICAL	8214235	4417K64	(SC)EGVA3/4

ALL GAS VALVES/STRAINERS

PROPER CLEARANCE MUST BE PROVIDED IN ORDER TO SERVICE THE STRAINERS A MINIMUM OF 4" CLEARANCE DISTANCE MUST BE PROVIDED AT THE BASE OF THE STRAINER CUSTOMER MUST VERIFY BTU CONSUMPTION AS WELL AS PRESSURE RATING SPECIFIC GRAVITY OF NATURAL GAS = 0.64, SPECIFIC GRAVITY OF LP = 1.52.

CALCULATIONS

TO CALCULATE GAS FLOW FOR OTHER THAN 1 IN.W.C. PRESSURE DROP
NEW BTU/HR = (BTU/HR AT 1 IN.W.C. PRESSURE DROP) X NEW PRESSURE DROP$^{0.5}$
TO CALCULATE GAS FLOW FOR OTHER THAN 0.64 SPECIFIC GRAVITY
NEW BTU/HR = (BTU/HR AT 0.64) X (0.64 / NEW SPECIFIC GRAVITY)$^{0.5}$.



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PLYMOUTH, MN 55441
REG75@CAPTIVEAIRE.COM
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Willow Lake School
WILLOW LAKE, SD, 57278

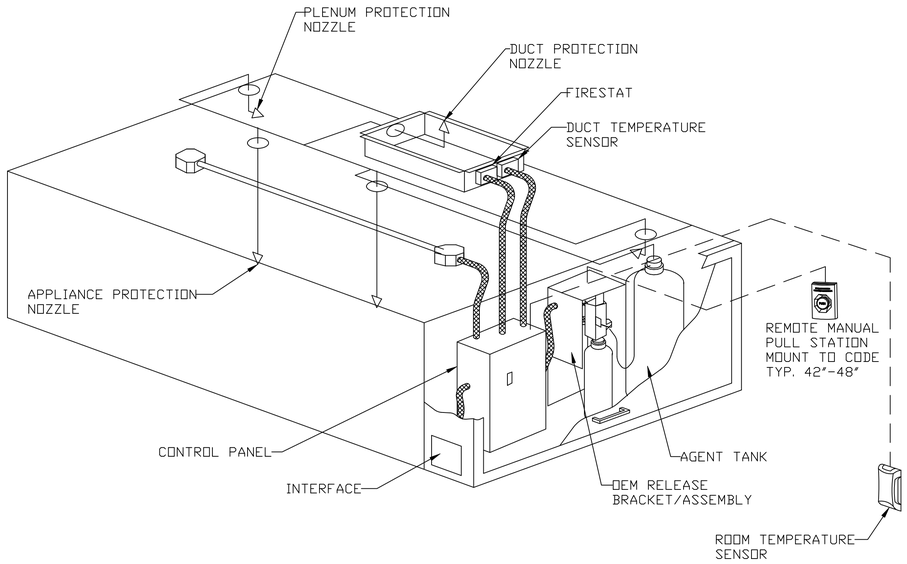
DATE: 1/26/2023
DWG.#: 5752374
DRAWN BY: CAH_75
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 3

ELECTRICAL PACKAGE – JOB#5752374

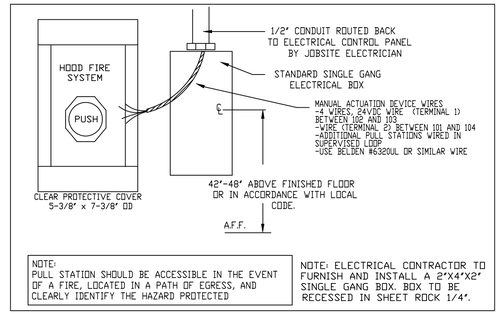
NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED				
				LOCATION	QUANTITY		TYPE	Φ	HP	VOLT	FLA
1	#12	DCV-1111	UTILITY CABINET RIGHT	UTILITY CABINET RIGHT	1 LIGHT	SMART CONTROLS DCV	EXHAUST	3	1.500	230	4.2
				HOOD # 1	1 FAN		SUPPLY	3	3.000	208	8.4

● EXHAUST FAN(S) INFORMATION: HP- VOLTAGE- PHASE- FLA-

● MAKE-UP AIR UNIT(S) INFORMATION: HP- VOLTAGE- PHASE- FLA-



TANK MANUAL ACTIVATION STATION DETAIL



NOTE: PULL STATION SHOULD BE ACCESSIBLE IN THE EVENT OF A FIRE, LOCATED IN A PATH OF EGRESS, AND CLEARLY IDENTIFY THE HAZARD PROTECTED

NOTE: ELECTRICAL CONTRACTOR TO FURNISH AND INSTALL A 2"X4"X2" SINGLE GANG BOX. BOX TO BE RECESSED IN SHEET ROCK 1/4".

TYPICAL TANK SYSTEM LAYOUT

SPECIFICATIONS:

THE RESTAURANT FIRE SUPPRESSION SYSTEM SHALL BE THE PRE-ENGINEERED TYPE WITH A FIXED NOZZLE AGENT DISTRIBUTION NETWORK. IT SHALL BE LISTED WITH UNDERWRITERS LABORATORIES, INC. (UL)

THE SYSTEM CONTROLS SHALL PROVIDE ALL NECESSARY MONITORING, TIMING AND SUPERVISION FUNCTIONS REQUIRED FOR THE RELIABLE OPERATION OF THE WET CHEMICAL FIRE SUPPRESSION SYSTEM. ALL DEVICES THAT ARE CRITICAL TO PROPER OPERATION SHALL BE SUPERVISED. THE SYSTEM SHALL INCLUDE A BATTERY BACK UP SYSTEM. IN THE EVENT OF A LOSS OF POWER TO THE BUILDING, THE BACKUP SYSTEM SHALL POWER ALL SYSTEMS NECESSARY FOR PROPER OPERATION.

THE SYSTEM SHALL BE CAPABLE OF AUTOMATIC DETECTION AND ACTUATION WITH LOCAL OR REMOTE MANUAL ACTUATION. THE DETECTION PORTION OF THE FIRE SUPPRESSION SYSTEM ALLOWS FOR AUTOMATIC DETECTION BY MEANS OF AN ELECTRIC THERMAL DETECTOR(S) LOCATED IN THE HOOD DUCT CONNECTION(S).

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Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023
DWG.#: 5752374
DRAWN BY: CAH_75
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 4

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE
5752374	DCV-1111		INSTALL
	JOB NAME: Willow Lake School	DATE: 1/26/2023	DWG NO: ECP #1-1

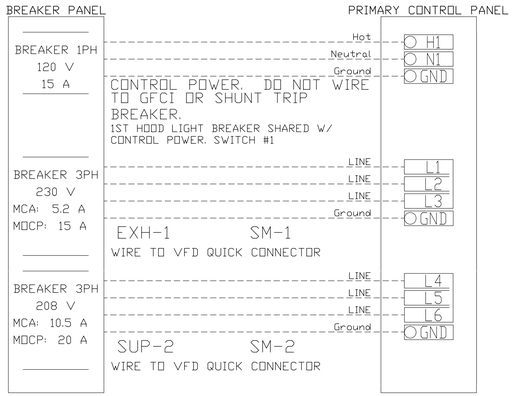
DESCRIPTION OF OPERATION:

Demand Control Ventilation, w/ control for 1 Exhaust Fan, 1 Supply Fan, Exhaust on in Fire, Lights out in Fire, Fans modulate based on duct temperature. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD. Room temperature sensor shipped loose for field installation.Verify distance between VFD and Motor; additional cost could apply if distance exceeds 50 feet.

BREAKER PANEL TO PRIMARY CONTROL PANEL

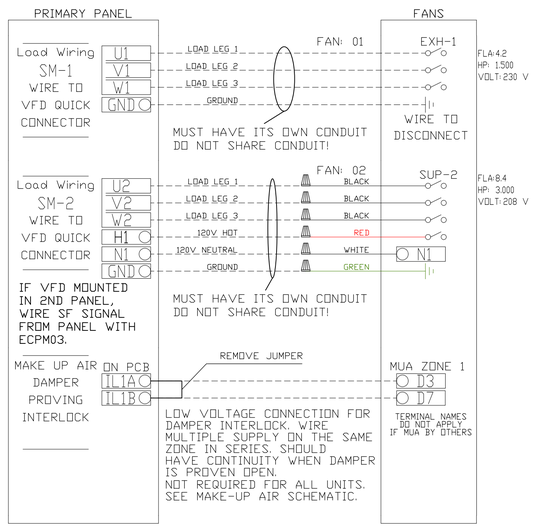
Responsibility: Electrician

BREAKER SIZE SHOWN IS THE MAXIMUM ALLOWED



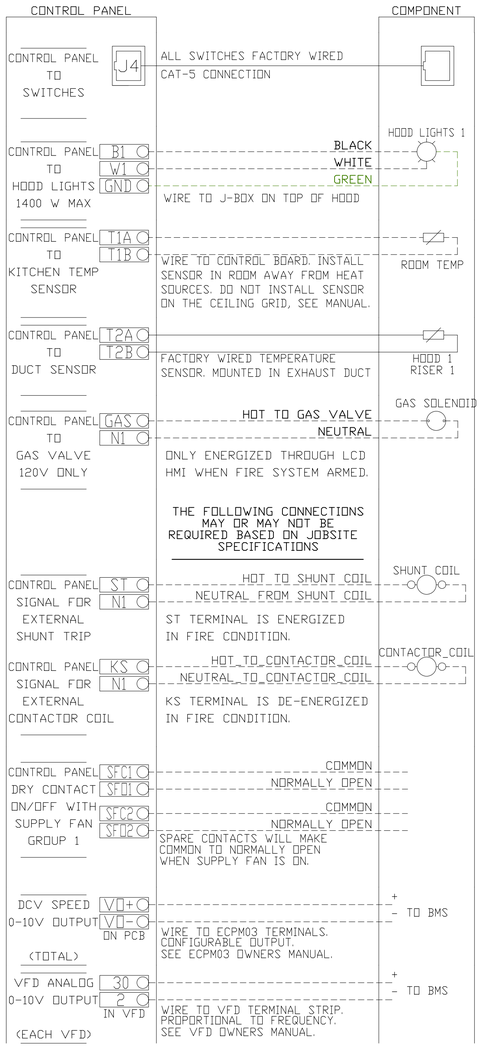
CONTROL PANEL TO FANS

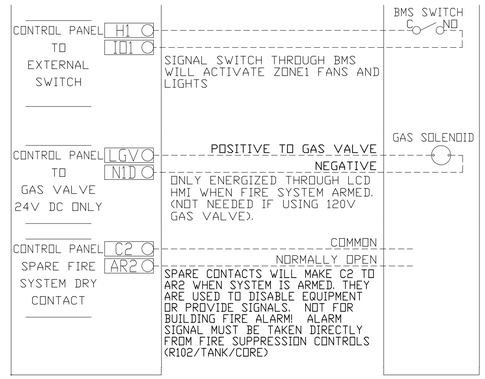
Responsibility: Electrician



CONTROL PANEL TO ACCESSORY ITEMS

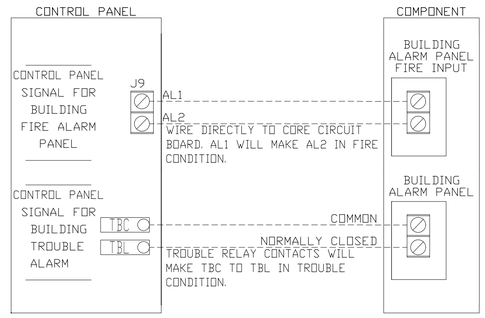
Responsibility: Electrician





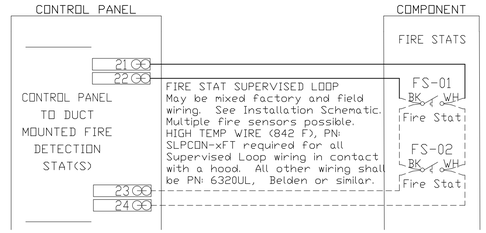
CONTROL PANEL TO FIRE SYSTEM

Responsibility: ALARM CONTRACTOR



CONTROL PANEL TO FIRE SYSTEM

Responsibility: CERTIFIED INSTALLER



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Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023

DWG.#: 5752374

DRAWN BY: CAH_75

SCALE: 3/4" = 1'-0"

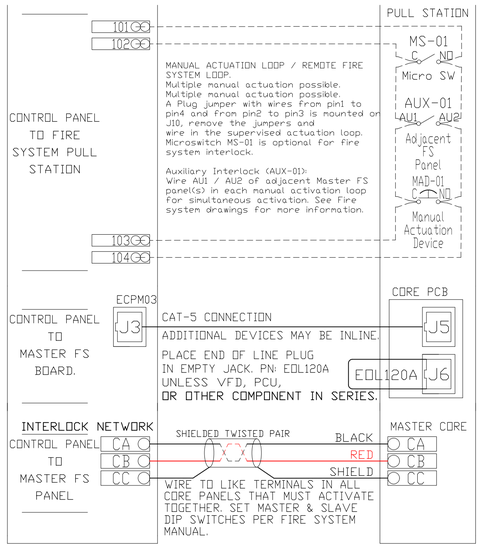
MASTER DRAWING

SHEET NO. 5

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE
5752374	DCV-1111		INSTALL
	JOB NAME: Willow Lake School	DATE: 1/26/2023	DWG NO: ECP #1-2

DESCRIPTION OF OPERATION:

Demand Control Ventilation, w/ control for 1 Exhaust Fan, 1 Supply Fan, Exhaust on in Fire, Lights out in Fire, Fans modulate based on duct temperature. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD. Room temperature sensor shipped loose for field installation.Verify distance between VFD and Motor; additional cost could apply if distance exceeds 50 feet.



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Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023

DWG.#: 5752374

DRAWN BY: CAH_75

SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 6

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
5752374	DCV-1111		INSTALL	Fire System #1 TANK FS - 40/40 (#1). Tank-based Fire Protection System equipped with Electronic Detection utilizing CORE Board as a Listed Release Mechanism. Installed in Hood Utility Cabinet with integral hood prewire panel.
	JOB NAME: Willow Lake School	DATE: 1/26/2023	DWG NO: ECP #1-3	

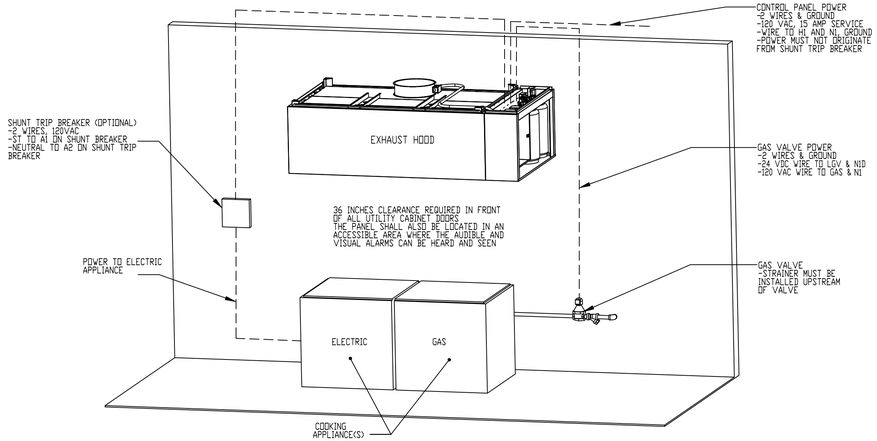
TANK PROTECTION ELECTRICAL DETAIL

02/10/2021 Rev. 2

FS-1: MASTER

ELECTRICIAN:
1. WIRE MAIN CONTROL PANEL PER INCLUDED SCHEMATIC
2. WIRE ALL FANS PER INCLUDED SCHEMATIC
3. WIRE SHUNT TRIP BREAKER (OPTIONAL)
4. WIRE UDS APPLIANCE KILL SWITCH, IF EQUIPPED (OPTIONAL)
5. WIRE GAS VALVE

ELECTRICAL CONTRACTOR REQUIREMENT					
ITEM	CONNECTION IN PANEL	CONNECTION IN DEVICE	VOLTAGE	AMPERAGE	COMMENTS
SHUNT TRIP BREAKER (OPTIONAL)	ST & N1	BREAKER COIL (A1 & A2)	120 VAC	< 4 AMPS	ST TO A1 ON SHUNT BREAKER COIL, AND NEUTRAL TO A2 ON SHUNT TRIP BREAKER COIL
CONTROL PANEL POWER	H1 & N1 + GROUND	CIRCUIT BREAKER	120 VAC	15 AMPS	CONTROL PANEL POWER MUST NOT BE RUN THROUGH SHUNT TRIP BREAKER
UDS APPLIANCE KILL SWITCH (OPTIONAL)	KTS & N1	KTS & N1	120 VAC	< 4 AMPS	KILL SWITCH TERMINALS MUST BE IN SERIES WITH OTHER KILL SWITCHES
REMOTE 120VAC ANSUL AUTOMAN (OPTIONAL)	AU1, AU2	SOLENOID	120 VAC	< 6 AMPS	120V TO AU1, AU2 TO ANSUL ELECTRIC AUTOMAN, ANSUL SOLENOID TO NEUTRAL
GAS VALVE	LGV & N1D (IF 24 VDC) GAS & N1 (IF 120 VAC)	RED/RED/GREEN	24 VDC OR 120 VAC	< 1.0 AMPS	IF 24 VDC - 2 WIRES & GROUND, N1D TO RED, LGV TO RED, AND GREEN TO GROUND IF 120 VAC - 2 WIRES & GROUND GAS TO RED, N1 TO RED, AND GREEN TO GROUND



NOTE: SEE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR FURTHER INSTRUCTIONS

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
5752374	DCV-1111		INSTALL	Fire System #1 TANK FS - 40/40 (#1). Tank-based Fire Protection System equipped with Electronic Detection utilizing CORE Board as a Listed Release Mechanism. Installed in Hood Utility Cabinet with integral hood prewire panel.
	JOB NAME: Willow Lake School	DATE: 1/26/2023	DWG NO: ECP #1-4	

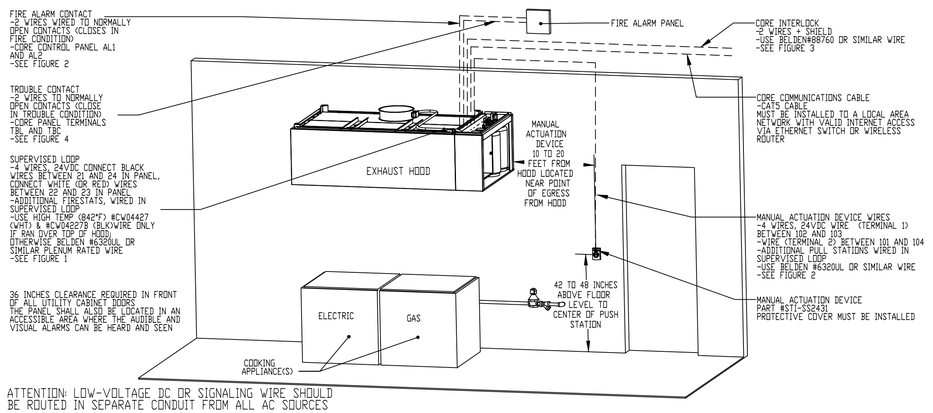
TANK PROTECTION LOW-VOLTAGE DETAIL

02/10/2021 Rev. 2

FS-1: MASTER

ALARM CONTRACTOR:
1. WIRE MANUAL ACTUATION DEVICE(S), REMOTE FIRESTAT(S), CORE INTERLOCK(S), FIRE SENSOR(S) AND FIRE ALARM CONTACTS
2. COMPLETE FINAL HOOKUP OF SYSTEM
3. VERIFY FINAL FIRE SYSTEM TEST

ALARM CONTRACTOR REQUIREMENT					
ITEM	CONNECTION IN PANEL	CONNECTION ON DEVICE	VOLTAGE	AMPERAGE	COMMENTS
MANUAL ACTUATION DEVICE(S)	101 AND 104 102 AND 103	1 & 2	24 VDC	< 10 AMPS	WIRE MANUAL ACTUATION DEVICE TERMINAL 1 BETWEEN CORE PANEL TERMINALS 102 AND 103 WIRE MANUAL ACTUATION DEVICE TERMINAL 2 BETWEEN CORE PANEL TERMINALS 101 AND 104 JUMPER 101 TO 104 AND 102 TO 103 IF NO MANUAL ACTUATION DEVICE IS INSTALLED
MANUAL ACTUATION DEVICE COVER	N/A	N/A	N/A	N/A	MANUAL ACTUATION DEVICE COVER MUST BE INSTALLED IF SURFACE MOUNTED, USE COVER EXTENSION STI-6531B
REMOTE FIRESTAT SENSOR(S)	21 AND 24 22 AND 23	BLACK AND WHITE	24 VDC	< 1.0 AMPS	WIRE FIRE SENSOR WHITE WIRES BETWEEN HOOD CORE PANEL TERMINALS 22 AND 23 WIRE FIRE SENSOR BLACK WIRE BETWEEN HOOD CORE PANEL TERMINALS 21 AND 24 HIGH TEMP (842°F) #CW04427 (WHT) & #CW044278 (BLK)WIRE OR SIMILAR ONLY IF RAN OVER TOP OF HOOD, OTHERWISE BELDEN #6320UL OR SIMILAR PLENUM RATED WIRE. SEE FIGURE 1
FIRE ALARM CONTACT	AL1, AL2	VARIES	50V MAX (AC/DC)	UP TO 1 AMP	FIRE ALARM RELAY CONTACTS FOR BUILDING FIRE ALARM LOCATED IN THE CORE ELECTRICAL CONTROL PANEL
CORE INTERLOCK(S)	ILA, ILB, ILC	ILA, ILB, ILC	RS-485 COMMUNICATIONS SIGNAL		CORE SYSTEM (1) ILA, TO CORE SYSTEM (2) ILA. CORE SYSTEM (1) ILB, TO CORE SYSTEM (2) ILB. CORE SYSTEM (1) ILC, TO CORE SYSTEM (2) ILC. USE BELDEN# 88760 OR SIMILAR WIRE
TROUBLE CONTACT	TBC, TBL, TDK	VARIES	MAX 120 VAC	UP TO 6 AMPS	WIRE TO TBL & TBC NORMALLY OPEN CONTACT, CLOSES IN TROUBLE CONDITION
CORE COMMUNICATIONS CABLE	RJ-45 Jack	INTERNET CONNECTION	SIGNAL	<1.0 AMPS	TYPICAL CONNECTION CAT5 CABLE TO LOCAL AREA NETWORK VIA ETHERNET SWITCH OR WIRELESS ROUTER WITH VALID INTERNET CONNECTION



ATTENTION: LOW-VOLTAGE DC OR SIGNALING WIRE SHOULD BE ROUTED IN SEPARATE CONDUIT FROM ALL AC SOURCES

NOTE: SEE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR FURTHER INSTRUCTIONS

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Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023

DWG.#: 5752374

DRAWN BY: CAH_75

SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 7

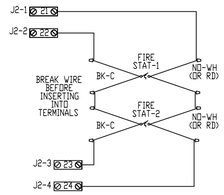
JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE
5752374	DCV-1111		INSTALL
	JOB NAME Willow Lake School	DATE 1/26/2023	DWG NO ECP #1-5

DESCRIPTION OF OPERATION:
Fire System #1 TANK FS - 40/40 CH11. Tank-based Fire Protection System equipped with Electronic Detection utilizing CORE board as a Listed Release Mechanism. Installed in Hood Utility Cabinet with integral hood prewire panel.

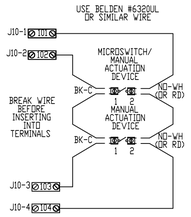
TANK PROTECTION LOW-VOLTAGE FIGURES

02/10/2021 Rev. 17

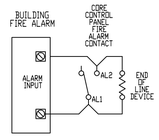
FS-1: MASTER



WIRING CONNECTIONS FOR FIRESTAT LOOP
FIGURE 1



WIRING CONNECTIONS FOR MANUAL ACTUATION LOOP
FIGURE 1A



WIRING CONNECTIONS FOR FIRE ALARM CONTACT
FIGURE 2

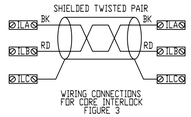
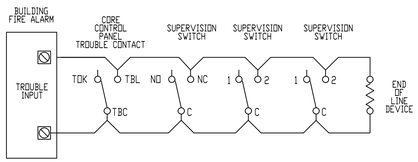


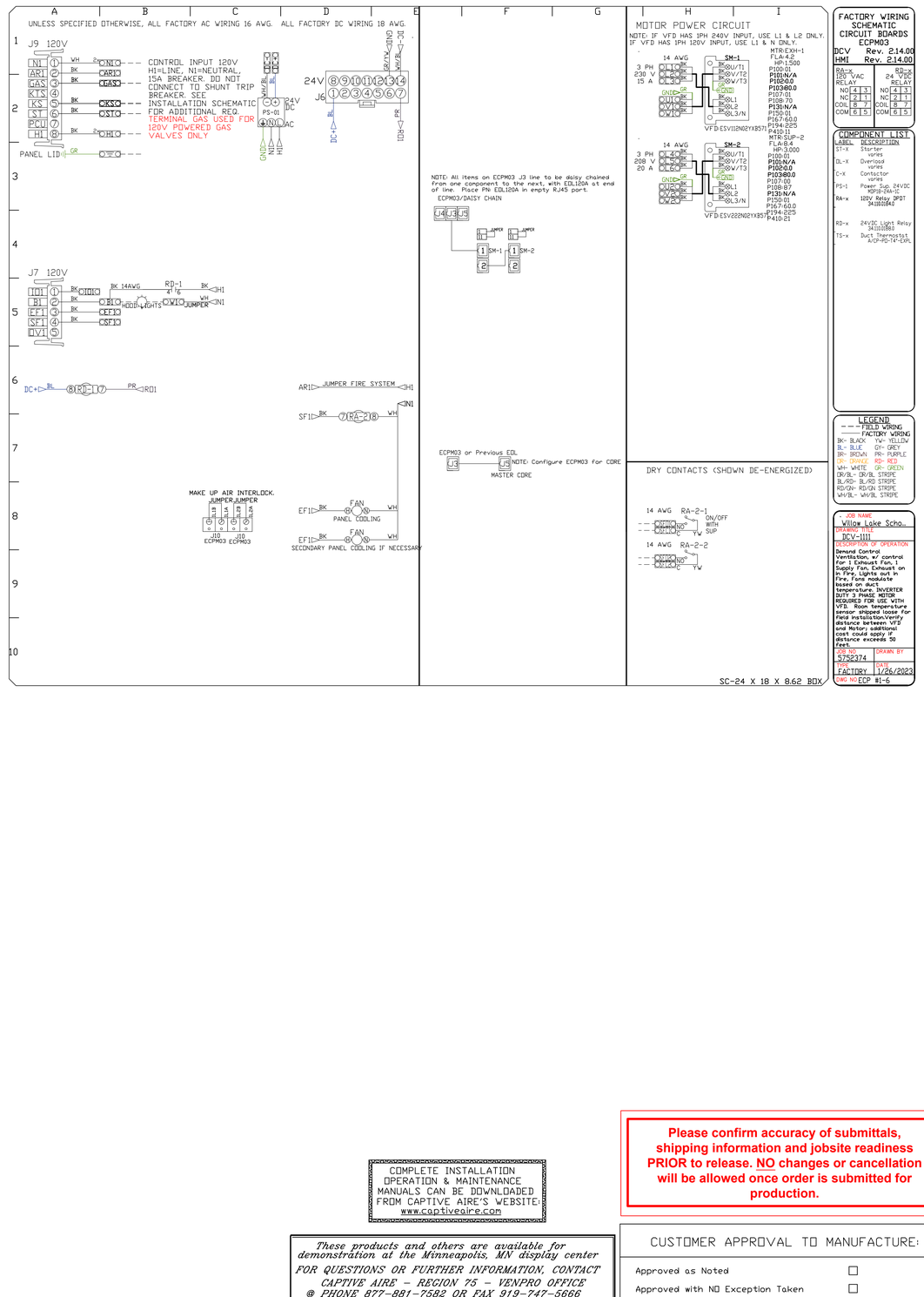
FIGURE 3



WIRING CONNECTIONS FOR TROUBLE CONTACT
FIGURE 4

NOTE: SEE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR FURTHER INSTRUCTIONS

ATTENTION: LOW-VOLTAGE DC OR SIGNALING WIRE SHOULD BE ROUTED IN SEPARATE CONDUIT FROM ALL AC SOURCES



FACTORY WIRING SCHEMATIC CIRCUIT BOARDS
ECPM03
DCV Rev. 2.14.00
HMI Rev. 2.14.00

RA-x 120 VAC RELAY			RD-x 24 VDC RELAY		
NO	4	1	NO	4	1
NC	2	1	NC	2	1
COIL	8	7	COIL	8	7
COM	6	5	COM	6	5

COMPONENT LIST

LABEL	DESCRIPTION
ST-x	Starter varies
DL-X	Duct Overload varies
C-X	Contactor varies
PS-1	Power Sup 24VDC MDP20-24A-1C
RA-x	120V Relay 2P2T 3410010140
RD-x	24VDC Light Relay 3410010180
TS-x	Duct Thermostat A/CP-PD-T4*-EXPL

LEGEND
- - - FIELD WIRING
——— FACTORY WIRING

BK- BLACK YW- YELLOW
BL- BLUE GY- GREY
BR- BROWN PR- PURPLE
OR- ORANGE RD- RED
WH- WHITE GR- GREEN
DR/BL- DR/BL STRIPE
BL/RD- BL/RD STRIPE
RD/GN- RD/GN STRIPE
WH/BL- WH/BL STRIPE

JOB NAME: Willow Lake Scho..
DRAWING TITLE: DCV-1111
DESCRIPTION OF OPERATION:
Demand Control Ventilation, w/ control for 1 Exhaust Fan, 1 Supply Fan, Exhaust on H.Fire, Lights out in Fire, Fans modulate based on temperature. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD. Room temperature sensor shipped loose for field installation.Verify distance between VFD and Motor; additional cost could apply if distance exceeds 50 feet.

JOB NO	DRAWN BY
5752374	
TYPE FACTORY	DATE 1/26/2023
DWG NO ECP #1-6	

COMPLETE INSTALLATION OPERATION & MAINTENANCE MANUALS CAN BE DOWNLOADED FROM CAPTIVE AIRE'S WEBSITE: www.captiveaire.com

These products and others are available for demonstration at the Minneapolis, MN display center
FOR QUESTIONS OR FURTHER INFORMATION, CONTACT CAPTIVE AIRE – REGION 75 – VENPRO OFFICE @ PHONE 877-881-7582 OR FAX 919-747-5666
14505 21st AVE. N. SUITE 222
PLYMOUTH, MN 55441
REG75@CAPTIVEAIRE.COM
PRODUCTION WILL BEGIN ONCE APPROVED DRAWINGS ARE RECEIVED.

Please confirm accuracy of submittals, shipping information and jobsite readiness PRIOR to release. NO changes or cancellation will be allowed once order is submitted for production.

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted ☐
Approved with NO Exception Taken ☐
Revise and Resubmit ☐
SIGNATURE _____
Your Title _____ Date _____

REVISIONS

	DESCRIPTION	DATE:
△		
△		
△		
△		

CAPTIVE AIRE
www.captiveaire.com
Minnesota Office
14505 21st Ave. N., Suite 222, Plymouth, MN, 55447 PHONE: (763) 432-5354 FAX: (919) 747-5666 EMAIL: reg75@captiveaire.com

Willow Lake School
WILLOW LAKE, SD, 57278

DATE: 1/26/2023
DWG.#: 5752374
DRAWN BY: CAH_75
SCALE: 3/4" = 1'-0"
MASTER DRAWING

SHEET NO. 8

SECTION 115300

LABORATORY EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Low velocity bench fume hoods.

B. Furnishing of all service outlets, accessory fittings, electrical receptacles and switches in or on fume hoods.

C. Fume hoods with accessories shall be pre-piped and prewired.

1. Pre-pipe service fittings to single point connection at 6 inches above top of hood or as otherwise shown.
2. Pre-wire all electrical devices to junction box at top of hood.
3. Prep pipe vacuum turrets to cabinet below hood. See drawings.

D. Stand-alone flammable and corrosive/acid storage cabinets.

1.2 RELATED WORK

A. Mechanical: Mechanical services and final connections. P-trap, waste piping, and tailpiece extensions for cup sinks. Rectangular to round duct transition to fume hood exhaust collar as required for ductwork. Field calibration of the fume hood.

B. Electrical: Electrical services, fittings, and final connections.

1.3 SUBMITTALS

A. Manufacturer's Product Data for each product and accessory.

B. Manufacturer's certification that products comply with the Contract Documents.

C. Selection Samples of full range of standard finishes.

D. Shop Drawings, including fabrication and installation drawings, plans, elevations, ends, cross-sections, large- scale details, showing service run spaces, location and type of service fittings, shelves, accessories, anchorage, and adjacent materials.

E. Rough-in drawings and service requirements for mechanical and electrical.

F. Verification Samples of selected finishes. Furnish 2 or more Samples as required to illustrate range of finish color and texture of installed products.

G. Certification by an independent testing company stating that manufactured finish complies with Specifications, and that equipment is installed per applicable and referenced codes and standards, adjusted and balanced for design operations, and is complete and ready for intended function.

H. Certification of fume hood compliance at the point of manufacture in accordance with ASHRAE 110-1995 testing requirements. Furnish for each style and size of fume hood prior to delivery.

I. Certification of fume hood compliance with design criteria for maximum allowable noise within laboratories.

1. Hoods operating with a face velocity of 100 feet per minute: Maximum allowable decibel level of 65 dBA measured 36 inches away from, and perpendicular to, face of fume hood.
2. Hoods operating with a face velocity of 125 feet per minute: Maximum allowable decibel level of 70 dBA measured 36 inches away from, and perpendicular to, face of fume hood.

J. Operating and maintenance manuals that describe proper operating procedures, maintenance

and replacement schedules, component parts list, and closest factory representative for components and service.

K. Equipment manufacturer's written certification that accessible hoods are in compliance with the Americans With Disabilities Act (ADA).

L. Service fixture manufacturer's written certification that service fixtures are in compliance with the Americans With Disabilities Act (ADA).

1.4 QUALITY ASSURANCE

A. Work of this Section shall comply with applicable provisions of Scientific Equipment and Furniture Association (SEFA) standards.

1. SEFA 1.2 - Laboratory Fume Hoods.
2. SEFA 2.3 - Installation of Scientific Laboratory Furniture and Equipment.
3. SEFA 3 – Work Surfaces.
4. SEFA 7 - Laboratory and Hospital Fixtures.
5. SEFA 8 – Laboratory Furniture, Casework, Shelving and Tables.

B. Tested and comply with ASHRAE 110. Hood shall be tested with a face velocity of 55 FPM with the sash at the maximum opening, 28 inches. The hood shall have a performance rating in the static portion of ASHRAE 110-1995 (Section 7.1-7.10) of AM 0.01 or better.

C. The laboratory fume hood manufacturer shall provide fume hood materials, accessories and service requirements all from a single manufacturer. Fabricated and shipped from the same geographic location to assure proper staging, shipment and single source responsibility.

D. Installer qualifications: Trained and certified by the laboratory fume hood manufacturer with 5 years experience manufacturing fume hoods specified in this section and related accessories, 5 installations of size equal to or larger than indicated.

E. Mock-Up: Provide one (1) fume hood as a mock up, including base cabinet(s). See drawings for specific location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers/Products:

1. Air Master Systems. “Eliminator HP Series Laboratory Hood”
2. Bedcolab, Ltd. “Vanguard VBV Variable Air Volume Fume Hood”
3. Kewaunee Scientific Corporation. “Supreme Air LV fume hood, Model LV05”
4. ICI Scientific/Jamestown Metal Products. “F-300 Series – Isolator^3 Bench Fume Hood”
5. Labconco Corporation. “Protector XL Laboratory Hood”
6. Mott Manufacturing. “Safeguard Fume Hood”
7. Others as approved.

B. Basis of design: Mott Manufacturing.

2.2 LOW VELOCITY BENCH FUME HOOD

A. Performance requirements:

1. Restricted by-pass high performance fume hood suitable for use with a variable air volume system.
2. Designed to yield 80 FPM, with Owner option to increase to 100 FPM, face velocity at 18 inch sash opening and capable of 60 FPM at 18 inch sash opening.

3. Maximum sash opening to be 28 inches.
4. Sash auto-return feature shall return the sash to 18 inches if opened wider.
5. A full-open sash latch to facilitate fume hood set-ups.

2.3 MATERIALS AND CONSTRUCTION

A. Fume hoods shall be of low volume belted counterweight sash / aerodynamic entry design to insure maximum operating efficiency. Sash and air entry framework of the hood shall minimize eddying of air currents at the

hood face and Cartesian rear baffle system shall minimize turbulence and vortexes in all portions of the hood interior.

B. Fume hood superstructure frame: A structure of steel support members shall be provided to support exterior panels, interior liner and baffle panels. To allow for maintenance and replacements, the interior baffle panels shall be removable without disassembly of the frame structure and outer steel panels. Likewise, the exterior steel panels shall be removable without disassembly of the frame structure and inner liner panels. Fume hoods that require disassembly of the superstructure for liner replacement are not acceptable.

C. Fume hood interior walls: Double wall ends, not more than 4.5 inches wide, with sash track flush with front vertical fascia, shall be provided to maximize interior working area. The area between the double wall ends shall be closed to house the remote control valves. The front vertical fascia section shall be in a plane 45 degree from the hood face and end walls. The front vertical fascia shall contain space required for service controls, electrical switches and receptacles.

D. Fume hood Liners: Interior liner panels shall be 1/4 inch thick epoxy resin sheets or fiberglass reinforced polyester (FRP) smooth surface panels of a neutral color. Interior liner panels shall be fastened using stainless steel screws with plastic covered heads or concealed fasteners. Flame spread of material as measured by ASTM E84 Class A flame spread rating (25 or less).

E. Hood work surface: Hood work surface shall be 1-1/4 inch thick molded epoxy resin made in the form of a watertight pan, not less than 3/8” deep and fully dished with a front ledge of 1 inch maximum in width. A cup drain flush with the recessed work surface shall be provided. The work surface and cup drain shall be black color.

1. The nominal 3 inch by 6 inch cup sink shall be of an anti-splash design with a horizontal rear outlet not extending more than 7 inches below the work surface.

F. Fume hood vertical sash: Vertical rising sash of 1/4 inch laminated safety glass. The sash shall have a neutral colored polyvinyl chloride horizontal member at the top and a full-length aerodynamic aluminum or stainless steel handle at the bottom.

1. Sash counterbalanced: A single weight to prevent tilting and binding during operation.
    a. The sash connected to the counterweight system with two, 1/2 inch wide stainless steel-reinforced polyurethane notched belts that engage a sprocketed shaft drive. Configured when lifted higher than 18 inches, the sash will return to the 18 inches operating position automatically.
    b. The sash to provide a 35-1/2 inches viewing height, with a maximum opening of 28 inches and incorporate a mechanism for latching it in the full-open position for hood set-up.

G. Fume hood airfoil: A 12 gauge painted steel, convergence z-cross section airfoil shall be mounted flush to the bottom of the hood opening. It shall provide no open space between it and the top front edge of the work surface. The foil shall assure a flow of air rearward within 1/2 inch above the work surface at all hood operating face velocities.

H. Fume hood baffles: The fume hood baffles shall be constructed of the same material as the hood lining. They shall consist of multiple sections with vertical slots and a continuous horizontal slot at the work surface. Each baffle panel shall be easily removable from the interior, without requiring liner disassembly.

I. Fume hood lighting: A one-tube, energy-efficient, LED light fixture shall be provided in the hood roof. Illumination at 13 inches above the work surface shall be at least 100 foot-candles. The light fixture shall be UL listed and isolated from the hood interior by a 1/4 inch thick tempered glass panel sealed from the hood cavity.

1. Hood size to fixture length: 4 foot with 3 foot fixture. 5 foot and 6 foot with 4 foot fixture. 8 foot with two 3 foot fixtures.

J. Fume hood services:

1. Service fitting valves shall be mounted on the hood front vertical fascia with the working components of the valve accessible from the hood exterior.
2. Valves shall be furnished with four arm handles with color-coded index buttons and color-coded service outlet.
3. Service outlets shall be mounted on the hood interior sidewall liner in a staggered arrangement, with the lowest outlets closest to the front, and the highest outlet closest to the rear.
4. Plumbing service outlets shall be WaterSaver Faucet Co. type as indicated, installed complete with all gaskets, grommets, and sleeves. Water fixtures equipped with accessible vacuum breakers.
5. Finish: Polished.

K. Fume hood electrical services: The hood superstructure shall be pre-wired and contain a UL label certifying acceptable wire gauge, connections, fixtures and wire color-coding. Electrical fixtures shall consist of two duplex receptacles and a light switch, both mounted to the front face of the fume hood. The duplex receptacles, 20 Amp., 125 volt AC, and 3-wire polarized grounded with ground fault interruption. The receptacles shall be specification grade, side wired only, to insure a positive connection. The light switch, 20 Amp, 125 volt AC, and 3-wire polarized grounded. Wiring shall terminate in one 6 inch by 6 inch by 4 inch service junction box located on the fume hood roof. Final wiring and circuit dedication shall be by others.

L. Access Opening: The interior end liner panels shall be furnished with a triangular shaped opening that provides access to the service piping and valves to facilitate installation and maintenance. The openings shall be filled with a removable gasketed panel made from fume hood liner material.

M. Fume hood dimensions: Double wall end panel thickness shall not exceed 4.5 inches. Interior clear working height shall be not less than 38 inches at any location in the interior of the hood on bench hoods. Interior depth from the back of the sash to the front of the rear baffle shall not be less than 24 inches. The sash opening shall be not less than 28 inches in height above the work surface on bench hoods.

N. Fume hood duct collar: Each fume hood, up to 8 feet in length, to contain one 12 inch diameter polyethylene bell-mouthed or cylindrical stainless steel duct collar in the hood roof for exhausting the hood.

O. Fume hood mechanical system connection: Provide cut out for variable air volume system controller. Coordinate with Contractor.

P. Comply with requirements in Division 22, Division 23 and Division 26 sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

1. Pre-wiring: Fume hoods shall be pre-wired to accessible junction box(es) at the top of the fume hood. Refer to Division 26 Sections for wiring, conduit and box materials. Make provisions necessary for fume hood control power on top of fume hood; refer to Division 23 Sections for fume hood controls.
    a. Provide one internal circuit for electrical outlets at fume hood sash opening and

one internal circuit for fume hood lighting and controls.

2. Pre-piping: Fume hood water and laboratory gas services shall be pre-piped to 6-inches above top of fume hood, at back of fume hood. Refer to Division 22 and Division 23 sections for piping materials for each type of service.
   a. Vacuum shall be pre-piped to 6-inches below bottom and at back of fume hood.

2.4 FUME HOOD FINISH

A. After the component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.

B. After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components shall be individually painted, insuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

2.5 ACCESSORIES

A. Fume Hood Ceiling Enclosure: Unless noted, provide height as needed to fill space between top of hood and ceiling. Same material and finish as fume hood.

B. Box Apron: 4 inch tall, open steel box, finished to match fume hood.

C. Lattice. The rack consists of vertical and horizontal 1/2 inch diameter Duralumin rods. The rods are fastened with rod clamps to form a lattice of approximate 12 inches squares. Bench hoods have three horizontal rods. Unless noted, provide at each hood.

2.6 STAND-ALONE FLAMMABLE AND CORROSIVE/ACID STORAGE CABINETS

A. Flammable Storage Cabinets: Cabinet size with number of adjustable shelves selected based upon Owner's requirements.

1. Manufacturer: Kewaunee Scientific Corp. bases of design.
   a. Asecos GmbH, S-Line Fire-Rated Safety Storage Cabinets: www.asecos.com.
   b. Kewaunee Scientific Corp, Series G65M; www.kewaunee.com/Casework/SafetyCabinets/Flammable Storage.
   c. Other as approved.
2. Cabinets meeting NFPA 30 Chapter 9.5.3, OSHA 29 CFR 1910.106 and FM regulations.
3. Material: 18 gauge double walled steel construction, 1.5 inch air space between wall materials, fully welded, continuous hinges on doors, lockable with non-sparking three-point latching.
4. Venting: Upper and lower diametrically opposed side vent with flame arrestor.
5. Doors: Self-closing pair of swing doors, self-latching synchronized doors.
6. Bottom Pan: 2 inches deep, liquid-tight containment pan covering entire bottom of cabinet.
7. Signage: Provide manufacturer's standard signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.

B. Corrosive and Acid Storage Cabinets: Cabinet size with number of adjustable shelves selected based upon Owner's requirements.

1. Manufacturer: Kewaunee Scientific Corp. bases of design.

a. Asecos GmbH, SL-Line Safety Storage Cabinets: www.asecos.com.
b. Kewaunee Scientific Corp, Series G85M; www.kewaunee.com/Casework/SafetyCabinets/Corrosive Storage.
c. Other as approved.

2. Cabinets meeting NFPA 30 Chapter 9.5.3, OSHA 29 CFR 1910.106 and FM regulations.
3. Material: 18 gauge double walled steel construction, 1.5 inch air space between wall materials, fully welded, continuous hinges on doors, lockable with non-sparking three-point latching.
4. Venting: Upper and lower diametrically opposed side vent with flame arrestor.
5. Doors: Manual closing pair of swing doors.
6. Bottom Pan: 2 inches deep, liquid-tight containment pan covering entire bottom of cabinet.
7. Signage as shown on drawings.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Work in this Section requires close coordination with Work specified in Mechanical and Electrical, as well as installation by Owner of Owner furnished components. Coordinate all Work to ensure an orderly process in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

B. Before beginning installation, carefully inspect installed Work to verify that it is complete to permit proper installation.

C. Verify that all Work has been installed in complete accordance with the original design, received submittals, and the manufacturer's recommendation.

D. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in the areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

A. Coordinate location and alignment of laboratory equipment and cabinets for proper connection of all piping and duct work.

B. Install equipment in accordance with applicable codes and regulations, accepted Shop Drawing, and as necessary for a complete operating system.

C. Install hood fittings, prepiped to a single point of connection 6 inches above the top of hood for connection by mechanical subcontractor; unless note otherwise, VAC low.

3.3 CLEANING AND PROTECTION

A. Repair, or remove and replace defective work as directed.

B. Adjust and lubricate moving or operating part to function within their design parameters.

C. Clean equipment; touch up as required.

D. Protect units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

END OF SECTION

SECTION 116143
STAGE CURTAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stage curtain fabrics.
B. Linings.
C. Scrims and drops.
D. Stage curtain track support systems.

1.02 RELATED REQUIREMENTS

A. Section 260533.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.
B. Section 260583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
B. ASTM A391/A391M - Standard Specification for Grade 80 Alloy Steel Chain 2021.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
D. FM (AG) - FM Approval Guide current edition.
E. ITS (DIR) - Directory of Listed Products Current Edition.
F. NEMA MG 1 - Motors and Generators 2021.
G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2023.
I. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting two weeks prior to the start of the 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 for each type of product as follows:
    1. Stage Curtains: Provide information on type of curtain, weight, location for use on project, and type of flame retardancy.
    2. Tracks: Provide capacity of each curtain track to support curtain weight and control curtain operation.
C. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.
    1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
    2. Submit fabric assembly and support details.
    3. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
    4. Submit attachment locations for grand drape, backdrop curtain, and proscenium curtain, and corresponding loads imposed on structure.
D. Selection Samples: Submit color chart for each type of stage curtain indicated that includes full range of colors, textures, and patterns available, along with 12 inch square fabric sample, in any color, of each fabric type and seam.
E. Verification Samples: Submit fabric full width by at least 12 inch long section of each selected fabric from dye lot to be used for this work, with specified treatments applied and showing repeat of patterns; mark top and face of fabric.
F. Manufacturer's Qualification Statement.
G. Installer's Qualification Statement.

H. Operation and Maintenance Data: For stage curtains and rigging operations.
I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Perform design of track support system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.07 FIELD CONDITIONS

A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
   1. Wet work in adjacent areas is complete and surfaces are dry.
   2. Work at and above ceiling level has been completed.
   3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.

B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.08 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.
   1. Defective Work includes, but is not limited to, stage curtain support and rigging that is not operating properly.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stage Curtain Fabrics: Basis of Design: Charisma Synthetic Velour, IFR by Rose Brand.
   1. Beck Studios Inc: www.beckstudios.net/#sle.
   2. Fred Krieger & Company: www.fredkriegerfabrics.com/#sle.
   3. LuXout Stage Curtains: www.luxout.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Stage Curtain Track Systems:
   1. Automatic Devices Co..
   2. J.R. Clancy.
   3. H & H Specialties.
   4. I. Weiss Theatrical Solutions.
   5. Texas Scenic.
   6. Thern.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.
B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
   1. Design Loads: Weight of stage curtains and track system.

C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.

1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:

D. Electrical Components: Devices that are listed and labeled in compliance with NFPA 70, by a qualified testing agency, and marked for designated application.

2.03 STAGE CURTAIN FABRICS

A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.

B. Polyester Velour: Weighing at least 25 ounces/linear yard, napped fabric of 100 percent polyester with minimum pile height of 75 mils, 0.075 inch and minimum width of 54 inch.
   1. Application: Main Traveler, Main Valance, Cyclorama Legs, and Borders curtains
   2. Color: As selected by Architect from manufacturer's full range.
   3. Texture: As selected by Architect from manufacturer's full range.
   4. Pattern: As selected by Architect from manufacturer's full range.

2.04 LININGS

A. Light-Weight Polyester Lining: Weighing at least 10 ounces/linear yard, 100 percent polyester fabric; 72 inch minimum width.
   1. Color: Black.

2.05 SCRIMS AND DROPS

A. Drops: Flat sewn muslin fabric with horizontal or vertical seams and selvage located along edges to rear of curtain.
   1. Application: Backdrop curtains.
   2. Continuous 6 inch high pipe pocket at bottom of curtain with 6 inch flap of matching fabric in front of pocket.
   3. 3-1/2 inch high double-stitched jute or laminated synthetic webbing at top of curtain with at least No. 2 brass grommets spaced at 12 inch on center and 1 inch from top corner of curtain.
   4. At least 2 inch wide double-folded side hem and 4 inch wide bottom hem.

2.06 CURTAIN TRACK

A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.
   1. Thickness: As recommended by manufacturer for curtain loads and operation.
      a. Heavy-Duty: 14 gauge, 0.0747 inch minimum thickness.

B. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.

C. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.

D. Track-Lap Clamp: Clamp that matches track channel finish as necessary for attaching two tracks at center overlap.

E. Operation:
   1. Motorized Operation: Curtain track with cord and pulleys.
      a. Operating Line: 1/4 inch diameter, stretch-resistant operating cord with braided synthetic-fiber cover over galvanized wire cable.
      b. End Pulleys: One single dead-end and one double live-end pulley, with sheaves having shielded ball bearings housed in plated-steel covers that match track finish, and with bracket for securing off-stage end of curtain.

F. Track System: Provide heavy-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.
   1. Carriers: Standard plated-steel carriers with a pair of nylon tired ball-bearing wheels riveted parallel to body, and equip carriers with rubber or neoprene bumpers to reduce noise and plated-steel swivel eye and trim chain for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.

a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier.

2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with molded-nylon-tired ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.07 CURTAIN TRACK OPERATORS

A. General: Provide operating machine as recommended by track manufacturer of size and capacity for each motorized curtain as indicated on drawings, with electric motor and factory wired motor controls, starter, gear-reduction unit, brake, and control station.

B. Type of Operator:

C. Motor: In compliance with NEMA MG 1 requirements, and sized to start, accelerate, and operate curtain in either direction and from any position on track at rated speeds and service factor.
1. Electrical Characteristics: 120 VAC; 3-phase; 60 hertz; continuous running duty type.
2. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with electrical system available for each location.

D. Controllers, Disconnect Switches, Wiring and Wiring Devices: Manufacturer's standard, unless otherwise indicated.

E. Control Station: Momentary contact, three-button control station with push-button controls labeled - Open, Close, and Stop.
1. Enclosures: Key-accessed and keyed alike, with one key for each enclosure and one extra key.
2. Switches: Key-operated and keyed alike, with one key for each switch and one extra key.

F. Limit Switches: Fully closed and fully opened preset stops.

2.08 FABRICATION - CURTAINS

A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.
1. Facing the full width of material at center meeting edges.
2. Curtains that are tabled square, and hems that don't pucker.
3. 1-1/2 inch clearance from floor at bottom of curtain.
4. Curtains are 24 inch longer than clear height of valance opening.
5. Curtains that overlap 36 inch at the center.
6. Curtains that extend 24 inch on each side beyond full width of proscenium opening.

B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:
1. Vertical Hems: Fabricate at least 2 inch wide, and at least 4 inch wide at borders, valances, teasers, and tormentors with at least 1 inch tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inch of face fabric, with at least 1 inch tuck, and vertically secured by sewing.
3. Top Hems: Fabricate by double-stitching 3-1/2 inch wide, heavy jute or laminated synthetic webbing to top edge at back side of curtain with at least 2 inch of face fabric turned under.

C. Fullness:
1. Flat: Zero percent fullness in curtains.
2. 50 Percent Fullness: Provide this fullness, exclusive of turnbacks and hems, and spaced at 12 inch on center along top hem reinforcement as follows:

D. Grommets:
1. Black Colored Curtains: No. 3 brass, No, 4 brass, or aluminum grommets with black finish.
2. Flat Curtains: No. 3 brass blind grommet top finish to mask battens using hidden pairs of grommets at 12 inch on center and 1 inch from corner of curtain; for ties.

3. Pleated Curtains: Provide grommets centered on each box pleat and placed 1 inch from corner of curtain; for snap hooks or S-hooks.

E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:
   1. For Flat Curtains Without Fullness: Fabricate with 4 inch high lined hem with pocket for sliding pipe or conduit weight and stiffener into bottom of curtain 2 inch longer than bottom edge of pocket.
   2. For Curtains With Fullness:
      a. Curtains That Don't Hang to Floor: Hems at least 3 inch deep, with weight tape, 3/4 inch, and open ends of hems sewn closed.
      b. Floor Length Curtains: Hems at least 6 inch deep, with 1 inch weight tape sewn to top seam of bottom hem, clear of finished bottom edge, and open ends of hems sewn closed.
   3. Lining: Provide lining for curtain with matching fullness of face fabric and finished 2 inch shorter than face fabric, and sew or otherwise securely fasten lining to top hem of face fabric.
      a. Attach lining to face fabric along bottom and side seams with 4 inch long strips of heavy woven cotton tape.

2.09 ACCESSORIES

A. S-Hooks: Manufacturer's standard heavy-duty plated wire hooks, at least 2 inch long.
B. Snap Hooks: Manufacturer's standard heavy-duty snap hooks, sewn into top edge of curtain.
C. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, colored to best match curtain; at least 5/8 inch wide by 36 inch long and threaded through grommets.
D. Support, Clamps, and Anchors: Galvanized after fabrication sheet steel, Class B in accordance with ASTM A153/A153M; manufacturer's standard thickness.
E. Trim and Support Cable: 1/4 inch diameter, 7x19 galvanized steel cable with minimum breaking load (MBL) of 7,000 lbs.
   1. Provide fittings in accordance with cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
F. Trim and Support Chain: Hardened alloy steel chain rated for overhead lifting, Grade 80 in accordance with ASTM A391/A391M.
G. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard and corrosion-resistant.
H. Pipe/Conduit Weight and Stiffener: Curtain manufacturer's recommended stiffening pipe/conduit that slides into bottom hem of curtain, as suitable for curtain fabric type and location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.
B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.03 INSTALLATION - CURTAIN

A. Track Hung: Secure curtains to track carriers with S-hooks.

3.04 INSTALLATION - BATTENS

A. Install battens by suspending at heights as indicated with trim and supports spaced as required to support loads; do not exceed 10 feet between supports.
   1. Cable Trim and Support:

a. Fasten cables securely to either structure or to inserts, eye screws, or other applicable devices that are appropriate for substrate and not subject to deterioration or failure with time or elevated temperatures.
b. Attach other end of cable to pipe clamps with turnbuckles, housed or fixed securely after adjustment to prevent loosening.

3.05 INSTALLATION - TRACK

A. Mounting of Track Assembly:
   1. Ceiling Mounted: Provide ceiling supports for mounting track direct to ceiling structure and within intervals indicated in manufacturer's written instructions for on center spacing.
   2. Beam Mounted: Install track by suspending from beam clamps securely mounted to structural I-beam and within intervals indicated in manufacturer's written instructions for on center spacing.

B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
   1. Heavy-Duty Track: 6 feet, maximum.
   2. Medium-Duty Track: 4 feet, maximum.

C. Install track for center-parting curtains with at least 24 inch overlap of track sections at center-line, and supported with track lap clamps.

3.06 INSTALLATION - DRAW-CURTAIN MACHINES

A. Install draw-curtain machines securely to supporting structure in accordance with manufacturer's written instructions, and adjust installations to operate smoothly and lubricate as recommended by manufacturer.
B. Coordinate installation of electrical equipment wiring with Section 260583.
C. Coordinate installation of conduit from disconnect to curtain machine components with Section 260533.13.

3.07 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.
B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.08 PROTECTION

A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

3.09 CURTAIN SCHEDULE

Quantity	Description	Height	Width per Section	Curtain Material	Color	Fullness
1	Main Valance	4'-0"	30'-0'	25 oz. IFR Velour	TBD	50%
2	Main Traveler Curtain	19'-0'	15'-0'	25 oz. IFR Velour	TBD	50%
1	Border Curtain	4'-0'	30'-0'	20 oz. IFR Velour	Black	50%
2	Leg Curtain	19'-0'	8'-0'	20 oz. IFR Velour	Black	Flat
1	Backdrop	19'-0'	36'-0'	Scenery Duck	White	Flat

END OF SECTION

SECTION 116813
PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete footings for playground equipment.

B. Playground equipment.

C. Swings.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Footings for playground equipment.

B. Section 321816.13 - Playground Protective Surfacing: Protective surfacing in playground area.

1.03 DEFINITIONS

A. Play Event: A piece of playground equipment that supports one or more play activities.

B. Use Zone: Area under and around a play event within which the ground surfacing must meet fall impact attenuation requirements of ASTM F1292 when tested at the fall height specified for the play event.

C. Fall Height: Vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it, as defined in ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subgrade: Surface of the ground on which the protective surfacing is installed; the subbase for the protective surfacing is installed over the subgrade.

1.04 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe 2021.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

D. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing 2020a.

E. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings 2018, with Editorial Revision.

F. ASTM B108/B108M - Standard Specification for Aluminum-Alloy Permanent Mold Castings 2019.

G. ASTM B179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes 2018.

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 C94/C94M - Standard Specification for Ready-Mixed Concrete 2021b.

K. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position 2018.

L. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test 2020.

M. ASTM D6662 - Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards 2022.

N. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment 2018, with Editorial Revision (2020).

O. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use 2021.

P. CPSC Pub. No. 325 - Public Playground Safety Handbook 2015.

1.05 SUBMITTALS

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

B. Proposals for Substitutions: Substitutions that will increase fall height, platform height, or maximum equipment height will not be considered; submit shop drawings with proposed modifications clearly identified and sufficient information to determine compliance with specified criteria.

C. Product Data: For manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.

D. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.

E. Samples: For each item that a color must be selected, provide color chart showing full range of colors and finishes.

F. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing materials and products specified in this section, with not less than Ten years of documented experience.
   1. Provide documentation showing that playground equipment similar to that specified has been installed in at least ten sites and in successful service for at least five years; provide addresses.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing play events and equipment.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Playground Equipment:
   1. GameTime, Inc.; www.gametime.com
   2. Kompan; www.kompan.com
   3. Miracle Recreation; www.miracle-recreation.com
   4. Landscape Structures, Inc.; www.playlsi.com
      a. Contact: Ken Follman, Dakota Fence; 800-726-4064, www.dakotafence.com
   5. Substitutions: See Section 016000 - Product Requirements.

B. Basis-of-Design Product: The design for each piece of playground equipment is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.02 PLAYGROUND EQUIPMENT - GENERAL

A. Design Assumptions: Because the safety of the playground depends on strict compliance with design criteria, this information is provided for Contractor's information.
   1. Playground has been designed for children ages 5 through 12.
   2. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

B. Mount equipment on concrete footings, unless otherwise indicated.
   1. Playground protective surfacing constitutes a resilient layer installed over a subbase (non-resilient) that is installed over subgrade; top of footings and anchorage devices is to be covered by full depth of resilient portion of protective surfacing.
   2. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must comply with specified requirements for equipment.
   3. Paint portion of support that is intended to be installed below top surface of protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.

C. Provide permanent label for each equipment item stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

2.03 PLAYGROUND EQUIPMENT

A. Comply with ASTM F1487 and CPSC Pub. No. 325; provide equipment complying with specified requirements for relevant age group(s).
   1. Provide components having factory-drilled holes; do not use components with extra holes that will not be filled by hardware or covered by other components.

B. Single-Axis Swings - 10' Height: Single-user swings seats suspended from steel chains.
   1. Basis-of-Design Product: Landscape Structures, 5000 Series Swing Frame.
      a. Seat Quantity: 6 Belt Seats
   2. Frame: Galvanized steel pipe or tubing connected beam sections and angled, two-leg, upright end supports.
      a. Color: As selected by Architect from manufacturer's full range.
   3. Overhead Beam Height: 120 inches from pivot point above protective surfacing.
   4. Chain: Galvanized standard link chain, 800 lb working load limit.
   5. Swing Connector: Stainless steel double clevis and bolt link.
   6. Swing Hanger: Anti-wrap swing hanger
   7. Standard Swing Seats: UV Stabilized EPDM rubber.
      a. Color: As selected by Architect from manufacturer's full range.

C. Freestanding Play Item 01:
   1. Basis-of-Design Product: Landscape Structures, Global Motion.
   2. Description: Two-level rotating net structure.

3. Color: As selected by Architect from manufacturer's full range.

D. Freestanding Play Item 02:
   1. Basis-of-Design Product: Landscape Structures, ZipKrooz, Two-Bay.
   2. Description: Two-way trolley system with a transfer deck at the end of each bay.
   3. Length: 50'-0"
   4. Color: As selected by Architect from manufacturer's full range.

E. Play Structure:
   1. Basis-of-Design Product: Landscape Structures, Venti Structure .
   2. Description: Multi-activity (20) structure, combining numerous nets, slides, belts and climbing features, with multiple entry points. ADA compliant.
   3. Posts: Powdercoated Steel.
   4. Color: As selected by Architect from manufacturer's full range.

F. Sand Digger:
   1. Basis-of-Design Product: SportsPlay, Sand Digger, Item Number: 361-509.
      a. Description: D-handled sand digger. Cast aluminum seat and scoop.
      b. Use area: 6'-0" Diameter
      c. Finish: Powdercoated.
      d. Footing: per manufacturer recommendations.
      e. Warranty: 1-year.

2.04 MATERIALS

A. Steel Pipe and Tube: Comply with ASTM A135/A135M, ASTM A500/A500M, or ASTM A513/A513M; hot-dipped galvanized and free of excess weld and spatter.
   1. Tensile Strength: 45,000 psi, minimum.
   2. Yield Point: 33,000 psi, minimum.
   3. Galvanizing: Hot-dip metal components in zinc after fabrication, in accordance with ASTM A123/A123M; remove tailings and sharp protrusions and burnish edges.

B. Extruded Aluminum: ASTM B221 or ASTM B221M, Alloy 6061, 6062, or 6063.
   1. Tensile Strength: 39,000 psi, minimum.
   2. Yield Point: 36,500 psi, minimum.

C. Cast Aluminum: ASTM B26/B26M, ASTM B108/B108M, or ASTM B179.

D. Chain: Corrosion resistant zinc plated steel; minimum size 4/0; polyvinyl chloride (PVC) coating.

E. Hardware: Provide without hazardous protrusions, corners, or finishes, and that require tools for removal after installation; countersunk fasteners are preferred.
   1. Use stainless steel for metal-to-metal connections; select type to minimize galvanic corrosion of materials connected by hardware.
   2. Use stainless steel for wood-to-wood and wood-to-metal connections.
   3. Use stainless steel with plastic components.
   4. Bearings: Self lubricating.
   5. Hooks, Including S-Hooks: Closed loop; maximum gap 0.04 inches, less than the thickness of a dime.
   6. Rails, Loops, and Hand Bars: Same metal as item is mounted on or aluminum; with powder coating.
   7. Anchors: In accordance with manufacturer's recommendations.

F. Opaque Plastic: Molded homogeneous plastic or wood-polymer composite lumber; do not use plastic as major load bearing members; use as deck boards, panels, and railings is acceptable.
   1. Homogeneous Plastic: Ultraviolet (UV) and color stabilized polyethylene without applied surface coating; color through entire thickness.
   2. Wood-Polymer Composite Lumber: Comply with ASTM D6662; factory finished.
   3. Decks and Platforms: Non-slip surface texture.
   4. Maximum Deflection: 1/360 of span, when tested in accordance with ASTM D648, with a uniform live load of 40 pounds/ft.

5. Deck Board Span: 12 inches on center, maximum, spanning minimum of 3 joists.
6. Panel Thickness: 3/16 inch, minimum.
7. Panel Edges: 3/16 inch radius, minimum.

G. Powder Coating for Steel: Electrostatically applied and oven cured polyester powder over electrostatic zinc coating.

H. Polyvinyl Chloride (PVC) Coating: Ultraviolet (UV) stabilized and mold-resistant; slip-resistant finish; prime parts to be coated with clear acrylic thermosetting solution, and preheat prior to dipping in liquid PVC.
1. Thickness: 0.08 inch, minimum, plus/minus 0.02 inch.
2. Hardness: 85 durometer, when tested in accordance with ASTM D3363.

I. Concrete: ASTM C94/C94M ready mix concrete; 28 days strength of 3,000 psi.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that playground area has been graded to subgrade elevations required and that excess soil, rocks, and debris have been removed.

B. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

C. Verify location of underground utilities and facilities in playground area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 PREPARATION

A. Stake location of playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

B. Stake layout of entire Use Zone perimeter before starting any work and before subbase under resilient surfacing is laid.
1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
2. Verify that Use Zones are free of obstructions that would extend into resilient portion of protective surfacing.
3. If conflicts or obstructions exist, notify Architect.
4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.03 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing specified in Section 321816.13; install protective surfacing after playground equipment installation.

B. Install concrete footings with top surface a minimum of 1/2 inch below required subgrade elevation.

C. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

D. Anchor equipment securely below bottom elevation of resilient surfacing layer.

E. Install without sharp points, edges or protrusions, entanglement hazards, pinch, crush, or shear points.

F. Do not modify play events on site without written approval of manufacturer.

G. Install required signage if not factory-installed.

3.04 FIELD QUALITY CONTROL

A. Owner or Owner's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.

B. Repair or replace rejected work until compliance is achieved.

3.05 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation; clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction (AHJ).

3.06 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. 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.

1.03 REFERENCE STANDARDS

A. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments 2019.
B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2023.
D. WCMA A100.1 - Safety of Window Covering Products 2018.

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.
D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
E. Selection Samples: Include fabric samples in full range of available colors and patterns.
   1. Motorized Shades: Include finish selections for controls.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
I. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
J. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.

1.06 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.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 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. Fabric: 25 years.

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:
      a. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
      b. Lutron Electronics Co., Inc: www.lutron.com/#sle.
      c. Hunter Douglas: www.hunterdouglas.com.
      d. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

2.02 WINDOW SHADE APPLICATIONS

A. Shades: Solar Screen Fabric.
   1. Type: Roller shades.
   2. Fabric: Basis of Design: GreenScreen Revive 1%.
   3. Color: As selected by Architect from manufacturer’s full range of colors.
   4. Mounting: Inside (between jambs).
   5. Operation: Manual and motorized, in locations indicated.

2.03 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. Flammability: Pass NFPA 701 large and small tests.
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: Clear anodized.
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.

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. 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.

B. Dimensional Tolerances: As recommended in writing by manufacturer.

C. 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. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 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. Wall-hung counters and vanity tops.
C. Sinks molded into countertops.
D. Window sills.
E. Epoxy resin sinks.

1.02 RELATED REQUIREMENTS

A. Section 123553.19 - Wood Laboratory Casework: Laboratory countertops.

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 D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position 2022.
E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
G. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
H. IAPMO Z124 - Plastic Plumbing Fixtures 2022.
I. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.
J. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material 2013.
K. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII 2016.
L. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
M. PS 1 - Structural Plywood 2019.

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. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
F. Installation Instructions: Manufacturer's installation instructions and recommendations.
G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. 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 AND SILLS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops (PLAM-2) : High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. Finish: Matte or suede, gloss rating of 5 to 20.
      c. Surface Color and Pattern: As indicated on drawings.
      d. Manufacturers:
         1) Basis of Design: Formica Corporation: www.formica.com.
         2) Substitutions: See Section 016000 - Product Requirements.
   2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
   3. Back and End Splashes: Same material, same construction.

C. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
   1. Manufacturers:
      a. Durcon, Inc: www.durcon.com/#sle.
      b. Prime Industries, Inc: www.piilab.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.
   2. Flat Surface Thickness: 1 inch, nominal.
   3. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
   4. Surface Finish: Smooth, non-glare.
   5. Color: Black.
   6. Exposed Edge Shape: 1/8 inch bevel chamfer.
   7. Drip Edge: Drip groove 1/8 inch wide and deep, located 1/2 inch back from edge on underside of all exposed edges.
   8. Back and End Splashes: Same material, same thickness; separate for field attachment.
   9. Sinks: Same material, same color; integrally molded with counter; bottom sloped to outlet; molded outlets; drain outlet located in back corner.
      a. Sides and Ends: 1/2 inch minimum thickness.
      b. Bottoms: 5/8 inch minimum thickness.
      c. Interior Corners: 1 inch minimum radius.
      d. Clamping collars for 1-1/2 or 2 inch diameter waste pipe, for sealed but not permanent connection.
      e. Steel channel supports front to back on each side, fastened to underside of top to support twice full sink weight.
   10. Associated Reagent Shelves and Ledges: Same material.
      a. Thickness: 3/4 inch.
   11. Associated Window Sills: Same material.
      a. Thickness: 3/4 inch.

D. Solid Surfacing Countertops (SS-1) and Window Sills: 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) Basis of Design: Corian.
   2) Substitutions: See Section 016000 - Product Requirements.
b. Sinks and Bowls: Integral castings; minimum 3/4 inch wall thickness; comply with IAPMO Z124.
c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
d. 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.

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.
   1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

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. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
C. Attach epoxy resin countertops using compatible adhesive.
D. 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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FIRE PROTECTION WORK SHALL INCLUDE:
SECTION 21 1000

PLUMBING, & HYDRONICS WORK SHALL INCLUDE:
SECTION 22 4000, 23 2113, & 23 2123
& SECTIONS 22 0500, 22 0510, 22 0700, 23 0500, 23 0510, & 23 0700 AS APPLIES

VENTILATION AND AIR CONDITIONING WORK SHALL INCLUDE:
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& SECTIONS 23 0500, 23 0510 & 23 0700 AS APPLIES

TEMPERATURE CONTROL WORK SHALL INCLUDE:
SECTION 23 0900
& SECTIONS 23 0500, 23 0510 & 23 0700 AS APPLIES

SECTION 21 1000
FIRE SUPPRESSION SYSTEMS

PART 1 GENERAL

1.01 DEFINITIONS

A. Contractor – Defined as the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the fire suppression system installation specified in Division 21 and/or as shown on the Contract Drawings.

B. Wet Pipe Sprinkler System – A system in which automatic sprinklers are attached to piping filled with water allowing water to discharge immediately from sprinklers when activated. Sprinklers activate when heat bursts a frangible glass bulb or melts a fusible link. System activation or incidental flow is monitored by flow switches and/or alarm valves. Hose connections are included when required by code.

C. Dry Pipe Sprinkler System – A system in which automatic sprinklers are attached to piping filled with compressed air until the event that heat from a fire activates a sprinkler by bursting a frangible glass bulb or melting a fusible link. Air that escapes through the activated sprinkler will cause air pressure loss in the system signaling the dry valve to open then delivering water to the piping and corresponding sprinklers. System activation or incidental flow is monitored by pressure switches, flow switches and/or alarm valves.

1.02 SCOPE

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 shall apply to this section.

B. Where any requirements specified on the plans conflict with the specifications of this section, the specifications indicated on the plans shall govern.

C. 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.

D. The fire protection system shall be a wet-pipe system consisting of a single zone to protect the building addition and portion of the existing building as defined by the plans. The system in office, classroom, and commons areas shall be designed for light hazardous classification. The storage, science, science prep, and mechanical areas shall be designed for ordinary hazard, group 1 classification. Stage area shall be designed for an ordinary hazard, group 2 classification as defined by the plans. Provide coverage for all concealed combustible spaces including, but not limited to the ceiling cavities and limited access storage spaces. 1-1/2” hose valves shall be installed on each side of the stage for mop up purposes.

E. System(s) will be supplied by an 6” underground combined fire sprinkler service located in Boiler C107.

F. 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.

G. See the plans for water supply flow test information.

1.03 CONTRACTOR QUALIFICATIONS

A. 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.

1.04 PERMITS AND SERVICE CHARGES

A. All permits and service charges necessary for execution of the work under this Contract shall be obtained by and 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.

1.05 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 the most recent editions of 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)
      a. NFPA 13 –Installation of Sprinkler Systems
      b. NFPA 25 – Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
      c. NFPA 72 – National Fire Alarm and Signaling Code
   3. National Electric Code (NEC) (NFPA 70)
   4. International Fire Code (IFC)
   5. Underwriter's Laboratory (UL)
   6. Uniform Plumbing Code
   7. International Mechanical Code
   8. American Waterworks Association (AWWA)
   9. Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA)
   10. International Building Code
   11. Americans with Disabilities Act (ADA)

B. 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.

C. All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

D. 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.

1.06 AUTHORITIES AND AGENCIES

A. All work will be installed for the approval and acceptance of the following:
   1. Willow Lake Fire Marshal
   2. SD Department of Health
   3. Fire Protection Engineer

1.07 DRAWINGS

A. In general, the Drawings of the fire protection 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.

B. Drawings of piping and sprinklers, 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.

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 pipe, duct, 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 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.

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.

1.08 SHOP DRAWINGS

A. Shop drawings to be submitted in electronic PDF format unless indicated otherwise in the General Conditions.

B. 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.

C. Submit shop drawings in electronic PDF format.

D. 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.

E. Shop Drawings will be reviewed by the Architect/Engineer, 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.

F. 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.

G. 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.

H. 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.

I. 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.

1.09 COORDINATION

A. 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 coordinate with the General Contractor to maximize the efficiency of the onsite placement and to ensure the safe delivery and storage of the materials.

1.10 EXISTING SERVICES

A. 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.

B. 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.

C. 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.

D. 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.

1.11 CLEANING

A. 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.

1.12 PAINTING

A. Painting of materials and equipment furnished shall be as described in DIVISION 9. Contractor shall refinish and restore to the original condition and appearance, all 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.

B. Where sprinklers are installed on exposed piping and in other locations where sprinklers are susceptible to paint spray or over-spray, contractor shall cover sprinklers in preparation for painting.

1.13 ACCESS TO EQUIPMENT

A. 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.

B. 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.

1.14 INSPECTIONS, TESTING, CERTIFICATES, & WARRANTY

A. All inspections, examinations and tests required by the authorities and agencies specified shall be arranged and paid for by the Fire Protection Contractor as necessary, to obtain complete and final acceptance of the Fire Protection System per the requirements of NFPA 13 and any other applicable codes. The Contractor shall provide a minimum 1 year warranty on the system effective starting the day of final system acceptance and also at that time be required to provide instruction to the owner or his representative to acquaint that person thoroughly with all system equipment.

B. After completion of the fire protection installation and at the start of the guarantee year, the Fire Protection Contractor shall execute and file five (5) copies of the "Contractor's Material and Test Certificate, Sprinkler systems - Water Spray Systems" with the Architect/Engineer.

1.15 RECORD DRAWINGS

A. 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.

1.16 OPERATING INSTRUCTIONS

A. 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 Section. 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. In addition to a hard copy of the operating instruction, provide an electronic copy in PDF format to the Owner.

B. 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.

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

A. 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.

B. Where two (2) or more materials are named, the choice of these shall be limited to the items named. Where the material or equipment named is followed by the phrase "or equal" the required function, dimension, appearance and quality to be met by any proposed substitute is all that is intended to be established.

C. Proposed substitutions for any named items shall be submitted to the Fire Protection Engineer for approval. No substitution shall be made without the approval of the Fire Protection Engineer. Any proposed substitution requests shall be submitted at least 10 days prior to bid to the Architect/Engineer for approval. Bidders shall not rely upon substitutions made in any other manner.

D. Should a proposed substitution wish to be made within 10 days of bid the Contractor 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.

E. All products shall be new and listed for fire protection use and be rated in excess of the maximum expected pressure that will be present in the systems.

2.02 SPRINKLERS

A. Except where designated otherwise on the drawings, sprinklers shall be as follows:
   1. Sprinklers shall be standard semi-recessed white-plated pendant type in all locations where piping is concealed above ceilings.
   2. Sprinklers shall be standard upright type where piping is installed exposed in storage, garage and other locations as indicated on the Drawings. Upright sprinklers shall be plain brass finish.
   3. Sidewall sprinklers, where permitted, shall be white-plated semi-recessed in finished rooms, plain brass elsewhere.

B. Temperature rating of sprinklers shall be in accordance with requirements of approving authorities, as noted on the Drawings, and per the requirements of NFPA 13.

C. Sprinklers shall be installed centered in square ceiling tile and in the narrow dimension of rectangular ceiling tile. In rectangular tiles sprinklers shall be centered or at the quarter points along the longer dimension of the tile.

D. Sprinklers installed in areas where damage may occur, such as gymnasiums, shall have head guards and as otherwise designated on the drawings. Sprinklers installed at elevations below 7'-0" shall have head guards.

E. Concealed brass sprinklers with flush white-plated concealer plate shall be installed where noted on the Drawings. Sprinklers shall be Tyco, Reliable, Victaulic, Viking, or equal.

2.03 ESCUTCHEONS

A. Escutcheons shall be installed as designated on the drawings and shall be the same make as the sprinkler head that is used.

B. Escutcheons shall be Tyco, Reliable, Victaulic, Viking, or equal.

2.04 PIPE AND PIPE FITTINGS

A. 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.

B. 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.

C. Wet fire sprinkler system (water-filled) 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 150, 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.

D. Dry fire sprinkler system (compressed air-filled) 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 150 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 standard-weight 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, ASTM A-153, 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.

E. All piping that penetrates an exterior wall shall be galvanized Schedule 40 minimum.

F. Plastic CPVC Schedule 80 piping and fittings are [not] allowed for this installation where approved by its listing.

G. Copper piping shall be installed where designated on the drawings and as per its listing. Copper piping shall be soldered when installed concealed and brazed when installed exposed. Piping shall be Type M Mueller, Cerro, or equal.

H. Flexible piping is not allowed for this project where approved by its listing and proven hydraulically.

I. All wet and dry system grooved pipe fittings and couplings shall be Victaulic, Anvil Gruvlok, Tyco, Star or equal. Grooved pipe fittings and couplings shall be ductile iron with an orange enamel coating for wet systems and galvanized coating for dry systems. All components shall be supplied by one manufacturer. Pipe fittings and couplings shall be standard or short radius.

J. All threaded fittings shall be black ductile iron for wet systems and where otherwise required by the drawings. All dry system threaded fittings shall be galvanized ductile iron. Threaded fittings shall be supplied by Tyco, Star, Anvil, or equal.

K. All welded outlet fittings shall be Merit, Island, or equal.

L. All flanged fittings shall be ductile iron per ASTM A536. Flanged fittings shall be Anvil, Star, or equal.

M. Plastic CPVC fittings are allowed for this installation where approved by its listing.

N. Copper fittings shall be installed where designated on the drawings and as per its listing.

O. All pipe ends shall be smooth and burr free and cleaned of any loose debris or pipe hole cutouts prior to installation.

2.05 HANGERS AND ATTACHMENTS

A. All piping 1/2” through 8” shall be hung through the use of galvanized ring style band hangers with a knurled swivel nut. Hangers, spacing, and rod diameters shall be per NFPA 13 requirements.

B. 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”.

C. Rings shall be Tolco, Hilti, Anvil, or equal.

D. Structural Attachments shall be Sammy, Tolco, Hilti, or equal.

2.06 FIRESTOPPING

A. Firestopping materials shall be 3M, Hilti, MetaCaulk, Nelson or equal. 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.

2.07 WALL, FLOOR AND CEILING PLATES

A. 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. 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.

2.08 CONTROL VALVES

A. All valves shall be new and listed for fire protection use.

B. Furnish and install valves in piping where so indicated on the Drawings.

C. 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.

D. 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.

E. 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.

F. 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.

2.09 WALL POST INDICATOR VALVE

A. Wall mount indicator post assembly butterfly valve with internal supervisory switch, painted steel wall plate, and grooved ends. Valve to be Nibco GD-4765-8WP or equal.

2.10 RISER MANIFOLDS

A. Riser manifolds 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.

B. Riser manifolds shall be Tyco, Viking, Reliable, or equal.

2.11 AUTOMATIC AIR VENT

A. 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.

B. The device shall meet the requirements of UL 2573.

C. Automatic air vent shall be Tyco, Viking, Reliable, or equal.

2.12 WATER FLOW SWITCHES AND ALARMS

A. Water flow switches for alarm bell/horn and tamper switches shall be furnished and installed by this Contractor. All required wiring shall be installed by the Electrical Contractor.

B. Water flow and tamper switches shall be Potter.

2.13 EXTERNAL BACKFLOW PREVENTER TEST CONNECTION

A. Furnish and install a Guardian Series 6900 or equal projecting 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.

B. 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.

C. External backflow preventer test connection shall be Guardian, Potter Roemer, Central, Elkhart, or equal.

2.14 FIRE DEPARTMENT CONNECTION

A. Furnish and install a Guardian Series 6100 or equal projecting 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.

B. 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.

C. Fire department connection shall be Guardian, Potter Roemer, Central, Elkhart, or equal.

2.15 DOUBLE CHECK VALVE BACKFLOW PREVENTER

A. 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. It shall be a complete assembly including four ball type test cocks.

B. The device shall meet the requirements of A.S.S.E. standard 1015 and A.W.W.A. standard C506.

C. Double check valve backflow preventer shall be Ames, Watts, Hersey, Conbraco, Febco, Wilkins or equal.

2.16 PRESSURE GAUGES

A. 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.

B. 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.

C. 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.

D. 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.

E. Pressure gauges shall be U.S. Gauge, Trerice, Weksler, Ashcroft, Weiss or equal.

PART 3 - EXECUTION

3.01 PIPING CONNECTIONS

A. 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.

3.02 PIPE HANGERS, SUPPORTS AND ANCHORS

A. 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.

B. 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.

C. Hanging from one pipe to another is prohibited.

3.03 PIPING INSTALLATION

A. 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.

B. 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.

C. 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, chase ways 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. If shown, pipe sizes on the Drawings are nominal pipe sizes and not outside diameters.

D. 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.

E. 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.

F. 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.

3.04 SLEEVES

A. Any pipe passing through building construction including walls, floors, roofs or masonry partitions or as noted on the Drawings shall be encompassed with sleeves. Piping passing through any fire rated barrier, walls, or floor shall be installed as follows:
   1. Sleeves shall have an inside diameter 1/2 inch greater than the outside diameter of pipe passing through. All sleeves shall be fabricated from new Schedule 40 steel pipe material cut square and reamed.
   2. 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.
   3. 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.
   4. Sleeves through roof slabs and floor slabs in concealed locations shall be Schedule 40 galvanized steel or linear polyethylene. Concealed sleeves shall be considered as pipe sleeves in shafts, pipe chases and within walls and partitions.
   5. 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.
   6. Floor sleeves in membraned floors shall be furnished with flashing rings and clamps.
   7. All sleeves in exposed locations, except equipment rooms, shall be set so plates specified will cover the sleeves.
   8. 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.

B. 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.

C. 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.

D. 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.

E. 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.

3.05 DRAINS

A. 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.

END OF SECTION

SECTION 22 0500
GENERAL PLUMBING 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.

1.2 SUMMARY

A. The mechanical contractor shall perform all work and furnish all materials as indicated in the mechanical plans and specifications as necessary for the successful completion of this project.

1.3 PERMITS AND SERVICES

A. The mechanical contractor shall obtain all permits and arrange all inspections, give notices and pay all fees as required by the Authority Having Jurisdiction.

B. This contractor shall coordinate any necessary site utilities including water, natural gas, and sewer work with local utility, owner, and other contractors to minimize disruption and downtime. Clarification to the Bidding - Any natural gas utility costs from Northwestern Energy will be paid directly by the owner and shall not be included as part of this contract. WITH THE EXCEPTION OF THE NATURAL GAS, ANY AND ALL CHARGES ASSESSED BY THE UTILITY OR CITY TO ACCOMMODATE THE REQUIREMENTS OF THIS PROJECT ARE THE SOLE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. VERIFY ALL CHARGES AND COORDINATE ALL EQUIPMENT NECESSARY WITH THE UTILITY BEFORE SUBMITTING BID.

1.4 DRAWINGS AND MEASUREMENTS

A. Verify all dimensions and conditions with Architectural and Structural drawings. The small scale of the drawings prohibits the indication of all offsets, fittings and accessories necessary and shall be furnished by this Contractor and required for complete and proper operation.

B. “Existing Conditions” shown on drawings are based on existing plans and limited field investigation. The field survey was conducted to verify, as much as possible, the accuracy of the locations shown. The Contractor shall verify the accuracy of the “Existing Conditions” as shown on the drawings. As the demolition work progresses perform modifications and additions as necessary to correct for these hidden conditions and allow for the completion of the new work.

C. The general arrangement of the mechanical systems shall be as shown on the drawings. Field changes shall have the written acceptance of the Engineer.

D. Consult the drawings and specifications of all other trades. Layout work and coordinate with other trades, before installing any equipment, to avoid interfering with these trades or conflicting with applicable codes.

E. The mechanical contractor shall bear full responsibility for coordinating his work with other trades to avoid conflicts in space requirements, clearances, etc. Problems arising due to lack of coordination will be the responsibility of the mechanical contractor to resolve. Extra work and/or equipment as a result of not coordinating work shall be the responsibility of the installing contractor and at no cost to the Owner.

1.5 INSPECTION OF SITE AND DOCUMENTS

A. Before submitting a proposal on the work contemplated, the bidder shall thoroughly familiarize himself with the contract documents, the site, and all existing conditions and limitations that may affect the performance of his work. Any conflict noted shall be brought to the attention of the Engineer before bidding. If there is not sufficient time prior to bidding, the Contractor shall bid the larger quantity or better quality of work.

B. No extra compensation will be allowed, because of misunderstanding the amount of work involved or the bidder's lack of knowledge, for obvious conflicts which could have been discovered or reasonably anticipated prior to bidding.

1.6 REGULATIONS AND CODES

A. All work, materials, and equipment in this contract shall comply with all applicable local, city, state and federal ordinances, regulations, and codes.

1.7 INSTRUCTIONS

A. Furnish verbal and engineer approved written instructions to Owner on all systems. Instruction shall include operating procedures, adjustments, and periodic maintenance. Furnish a copy of the written instructions and attach a letter to the Engineer, prior to final inspection, signed by Owner, attesting to date and satisfaction of instructions.

1.8 OPERATING AND MAINTENANCE MANUALS (3 Hard Copies & 1 Electronic Submittal via Submittal Exchange)

A. PRIOR TO FINAL INSPECTION, The mechanical contractor shall furnish (3) hard copies (including 1 USB drive containing electronic copy) and (1) electronic submittal via Submittal Exchange of the O&M Manuals to the Engineer, containing all pertinent data to the mechanical systems. Information shall be indexed and labeled per system and shall include catalog cuts, installation manuals, maintenance manuals, manufacturer's names, replacement parts list. Include balancing reports as specified. Include written instructions and warranty info as specified.

B. The first section shall be indexed/labeled "WRITTEN INSTRUCTIONS & TRAINING" noting written instructions with company service contact info and shall include a list of filters for each unit. Also include document with owners signature attesting to date and satisfaction of training.

C. The second section shall be indexed/labeled "WARRANTY INFO" and shall include a statement of guarantee on the contractors company letter head and shall include warranty statements of all equipment provided/installed under his contract with specific dates. This will note any longer/special warranties.

1.9 AS-CONSTRUCTED DRAWINGS <u>(Red Lined on Plans & USB Drive containing scanned PDF)</u>

A. During construction, each trade shall keep track of the major changes in the rerouting of piping and equipment, and shall note these in red on one set of drawings. This set of drawings shall be submitted with the Operation and Maintenance Manuals along with a USB drive containing a single PDF file with these same red line plans in electronic form. Most printing shops will be able to scan your trade's large plan sheets into electronic form. Contact the engineer's office if there are any questions.

1.10 WORKMANSHIP

A. Qualified individuals that are properly licensed to perform the work involved shall perform all mechanical work.

1.11 CUTTING AND PATCHING

A. This Contractor shall be responsible for all cutting and patching of holes required for passage of piping, equipment, and ducts. This also applies to the removal or installation of new equipment.

B. All cutting of existing construction required to install or join new work, except where otherwise indicated on the plans, shall be the responsibility of this Contractor and coordinated with the General Contractor. Before making any cuts, verify exact locations and sizes with the General Contractor to confirm that no structural members will be cut. Contractor shall make every effort to minimize extent of cutting existing construction.

C. The mechanical contractor shall be responsible for patching any openings left in floors, walls, and ceilings that were caused by his/her actions. Patching shall match existing surface in color, texture and quality so that patch is indistinguishable from original surface.

1.12 PAINTING

A. Any equipment which becomes rusted or damaged during construction shall be repaired, cleaned, and repainted by this Contractor. Painting shall always be applied in two coats, one primer and one finish.

1.13 EQUIPMENT AND PIPE SUPPORTS

A. Provide all structural supporting frames, steel stands, concrete bases, and hangers as required for mechanical equipment. All floor equipment shall be set on 4" high concrete bases furnished by this Contractor, unless otherwise noted.

B. Paint all unprotected metal, except galvanized and copper, with metal protective paint.

C. Hangers for piping shall be large enough to encompass insulation. It shall not be acceptable for insulation to envelope hangers/saddles, or for insulation to stop on either side of hangers.

D. Provide saddles at all hangers or supports of insulated piping. Saddles for 4" and larger piping shall be fabricated of 14 gauge galvanized iron, and for smaller piping shall be fabricated of 16 gauge galvanized iron. Saddles shall be one-half the circumference of the pipe insulation and 4" shorter than the insulation inserts.

E. Under no condition shall any pipe or duct structure be used to support another.

1.14 ACCESS TO EQUIPMENT

A. 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.

B. Access openings are required for manual, motorized, fire, and smoke dampers and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, etc., under this portion of the contract.

1.15 EXCAVATING AND BACKFILLING

A. When work to be completed by this contractor requires trenching, digging, etc. this contractor shall be responsible for properly protecting open trenches in accordance with required safety procedures. Backfill shall be placed in horizontal layers, not exceeding 9 inches in thickness. Moisten and hand or machine compact to 95% of standard proctor density. Bring fill to elevations indicated. If backfill fails the proctor density test in accordance with ASTM D-2049 and conducted by an independent testing laboratory retained by the owner, Contractor shall recompact and retest until satisfactory density is reached. This contractor shall restore the surface (whether grass, asphalt, concrete, etc.) to its original condition. Grass shall be seeded to match surrounding turf.

B. When work is in public street, paving repairs shall be equal to and comply with municipal agency requirements. If repairs are done by municipal agency, make necessary arrangement with such agency to make the repairs. Contractor shall include cost for permits, inspection fees, work, etc. in Mechanical Bid.

1.16 TESTING AND ADJUSTING

A. At the completion of work, all parts of the installation under Division 22 shall be cleaned, lubricated, tested, and adjusted for proper operation.

B. All piping and ductwork shall be tested and cleaned as required, by all local, state and federal codes. Tests shall be performed in the presence of the authority having jurisdiction. Written notification of test, date, and results shall be furnished to the Engineer before concealing or covering the installation.

C. All controls shall be tested and adjusted for proper operation. Adjustments shall be made when all systems are operating which may affect the control system.

D. An Independent Testing & Balancing Agent shall test and balance all mechanical systems as specified in Section 23 0593.

1.17 GUARANTEE

A. Warranty: The mechanical contractor shall warrant his work against failure and workmanship for a period of at least one year from the date of substantial completion, for all new work. Any work that is defective within that one-year period shall be replaced by the Contractor without charge. If longer/special warranties are noted elsewhere in the specifications, those warranties shall apply.

1.18 EQUIPMENT IDENTIFICATION

A. Major mechanical equipment, rooftop units, energy recovery ventilators, electric duct heaters, heat pumps, exhaust fans, etc. shall be provided with identification as designated on the plans. Labels shall be black laminate three-layer plastic with engraved 1/2 inch white letters, adhered, screwed, or riveted to the equipment. Manufactured by Brady, Champion America/Seton.

B. Piping shall be identified as to contents and flow direction with plastic, color coded, snap-on or adhesive labels. Manufactured by Brady, Champion America/Seton.
   1. Labeling shall be located:
      a. Adjacent to each valve.
      b. At each side of and at each obstruction.
      c. At each branch.
      d. At each cap for future.
      e. At each takeoff.
      f. At each side of penetration of structure or enclosure.
      g. At each equipment connection.
      h. At all access doors.
      i. A maximum of every 40 feet on straight runs of piping including rises and drops.
      j. Minimum one label per room/space.

C. Valve tags shall be brass with stamped letters, tag size 1-1/2” minimum in diameter.
   1. Provide typed valve lists in each O&M binder. Valve lists shall include the valve number, location, and purpose of each valve, and any other necessary information such as the required opening or closing of another valve when one valve is to be opened or closed.

D. Color coded indicators shall be installed on the ceiling grid or access door to hard lid areas to indicate all valves and other ceiling mounted equipment requiring service (example – VAV’s). Each trade shall be responsible for equipment provided under their respectable trade.
   1. Each ceiling label shall be color coded laminated engraved plastic, 1/16” thick, 2.5” wide by 0.75” tall, with white lettering centered on each label. Label to be adhered to the acoustic ceiling tile grid. Seton Style AV0175 or similar.

1.19 MECHANICAL SUBMITTAL

A. All equipment shall be as listed on the equipment schedules or approved equal.

B. Prior Approval: Manufacturers whose product is not specified or specifically listed on the plans or in the specifications are allowed to submit information on a product that they would like to be considered as an equal to those specified or listed. By submitting this information for consideration, the product representative is indicating that the product being presented for consideration equals or exceeds the specified product in quality, performance and operating parameters. Proof of equality rests with the party making the request. The procedure for this submittal is listed below.

C. Submit literature on product that is to be considered for prior approval. This literature shall include catalog cuts with all pertinent technical specifications, dimensions and pictures of the product.

D. Final approval of all equipment shall be contingent on shop drawing acceptance, compliance with the specifications and performance criteria as required. General approval to bid a product does not relieve the supplier or contractor of meeting specific specification requirements.

E. The Mechanical Contractor shall pay, provide, install and be responsible for any extra materials required due to his use of alternate accepted equipment which has installation requirements

different than the specified equipment. This includes paying other trades for any extra work they are involved in due to this substitution of equipment.

F. Literature shall be submitted so that the engineer receives it no later than 7 days prior to bid date.

G. All approvals will be in the form of an addendum issued to all plan holders.

H. List of Acceptable Substitutions:
   1. Equipment Identification, Pipe Labeling, Valve Tags, Ceiling Grid Labeling: Seton, Brady Corporation, Marking Services Incorporated
   2. All Drains (Floor & Roof): Wade, Zurn, Smith, Josam, Ancon, Watts.
   3. Valves: Crane, Hammond, Watts, Rockwell, Milwaukee Valve Co., Mueller.
   4. Plumbing Fixtures: American Standard, Kohler, Crane, Elkay, Just, Zurn, Fiat Products, Gerber, Bradley, Stingray
   5. Fixture Brass: American Standard, Kohler, Zurn, Sloan, T & S Brass, Chicago, Bradley, Swan, Woodford Mfg.
   6. Flush Valves: Zurn AquaVantage, Sloan, American Standard
   7. Lav Premolded Insulation Kit: Plumberex, Truebro, Proflo
   8. Toilet Seats: Kohler, Church, Beneke, Bemis, Olsonite, Zurn, Proflo
   9. Electric Water Coolers: Elkay
   10. Thermostatic Mixing Valves Under Lavs: Lawler, Powers, Watts
   11. Digital Water Tempering System: Watts, PVI
   12. Gas Fired Domestic Water Heaters: HTP, no substitutions (match existing relocated unit)
   13. Domestic Hot Water Recirculation Pump: Grundfos, B&G, Armstrong, Taco, Allis-Chalmers, General Signal Pump Group, Thrush, Patterson
   14. Domestic Water Expansion Tank: B&G, Taco, Wessels, Watts, Armstrong, Thrush

1.20 SHOP DRAWINGS

A. Before ordering any item, Contractor shall review, stamp with his approval and submit shop drawings of equipment as to be furnished under this contract.
   1. Electronic submittals are REQUIRED. Electronic submittals can be one combined .pdf. for each of the following mechanical trades: Fire Sprinkler Drawings, Fire Sprinkler Calcs, Fire Sprinkler Materials, Temperature Controls, HVAC, Plumbing, and Hydronics.

B. Where the contractor is submitting shop drawings that differ from the plans and specifications, the contractor must notify the engineer in writing each variance from the plans and specifications and the Mechanical Contractor shall pay, provide, install and be responsible for any extra materials required due to his use of alternate accepted equipment which has installation requirements different than the specified equipment. This includes paying other trades for any extra work they are involved in due to this substitution of equipment.

C. Product Data shall include, but are not limited to, the following: Manufacturer's product specifications, Manufacturer's installation instructions, standard color charts, catalog cuts, roughing-in diagrams and templates, and standard wiring diagrams.

1.21 TEMPORARY HEAT

A. Temporary heating of the building during construction will be provided as specified in the General Conditions and Supplemental General Conditions. Under no circumstance shall the proposed HVAC equipment be brought into service as temporary heating prior to project completion without written permission from the mechanical engineer & owner.

1.22 EXECUTION

A. Remove equipment as indicated. Demolition work shall be coordinated with the Owner. Should questions arise regarding the removal of equipment, confer with the owner before such equipment is demolished.

B. Materials removed by demolition shall remain the property of the Owner unless specifically noted. Material the Owner does not wish to retain shall be removed and properly disposed of by the Contractor.

C. The existing building will be in use during this construction. Schedule and carry out the work in such a manner as to cause the Owner a minimum of inconvenience due to service interruptions. Temporary services shall be installed if one area or phase of construction disrupts service to another area of the building or if equipment has to be relocated to allow construction to progress. Service interruptions shall be confined to the smallest area possible at any one time and interruptions shall be scheduled with the Owners site representative. After service has been restored following an interruption, inspect areas affected by the interruption and be responsible for returning automatically controlled equipment to the same operating condition that existed prior to the interruption.

D. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

F. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

G. Final locations of equipment may differ slightly from those shown on these plans. Coordinate exact location of equipment with equipment supplier, structural members, furniture layout and other trades before rough in and adjust accordingly. Pricing shall allow for a minimum of 10 ft. of difference in the actual location of items as compared to the location shown on the drawings.

H. All penetrations for piping, ductwork, etc. which penetrate floors, fire and/or smoke walls, roofs, full height partitions and similar structures shall be sealed by the mechanical contractor with a UL system specifically approved for the application. This system must maintain the required fire rating.

I. All mechanical systems shall be tested and cleaned as required by Authority Having Jurisdiction.

J. The mechanical contractor shall have the full responsibility of ensuring that his/her work is performed in a safe manner and shall bear all liability associated with his/her job site safety.

K. Upon completion of the work, the Contractor shall notify the A/E and make arrangements for a final inspection. Contactor shall provide A/E with copy of all required balance reports prior to the final inspection.

L. After the final inspection is made, the Contractor will receive a list of items requiring adjustment, correction, replacement, or completion.

M. The Contractor shall comply completely with all listed requirements within (40) days of receipt of list. Should the Contractor fail to perform within this time limit, the A/E and/or Owner reserves the right to have the work completed by others and the cost deducted from the contract price.

END OF SECTION 22 0500

SECTION 22 0510
BASIC PLUMBING 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.

1.2 SUMMARY

A. This section includes the following basic mechanical materials and methods to complement other Division 22 Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Sleeves.
   5. Escutcheons.
   6. Grout.
   7. Concrete bases.
   8. Mechanical Demolition.
   9. Installation requirements common to equipment specification sections.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 QUALITY ASSURANCE

A. All piping shall be specified in this section. Material and installation shall also be subject to state, local codes and ordinances of the area encompassing this project.

B. Welder’s Qualifications: All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

C. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

D. Uninsulated plastic waste, vent and roof drain piping is not allowed above any ceiling in a return air plenum.

E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Provide piping and factory fabricated fittings as indicated for each service and pipe size. Fitting sizes and types shall match piping or equipment connections. Where not indicated, comply with governing regulations or manufacturer's recommendations.

2.2 WATER SERVICE OUTSIDE OF BUILDING

A. Domestic water service below ground shall be ductile iron, bell and spigot. Ductile iron shall be Class 52 water pipe with mechanical joint fittings meeting AWWA Standard C153. Pipe and fittings shall be coated with asphaltum and internally cement lined.

B. Furnish and install thrust blocks and/or tie-rods in accordance with the local water department standards and regulations.

C. Provide a copy of the plot plan showing exact locations of all underground services direct to the engineer with accurate dimensions from the building such that all the underground service can be located.

2.3 WATER PIPING IN BUILDING UNDERGROUND

A. Domestic water piping in building below ground shall be ductile iron. The ductile iron shall be AWWA ductile iron, bell and spigot, class B water pipe with fittings being Class D ductile iron AWWA bell and spigot coated with asphaltum and/or Class 150 C.I. mechanical joints, Federal Specification WW-P-421 with rubber gaskets.

B. Furnish and install thrust blocks and/or tie-rods in accordance with the local water department standards and regulations.

C. Provide a copy of the plot plan showing exact locations of all underground services direct to the engineer with accurate dimensions from the building such that all the underground service can be located.

2.4 SANITARY WASTE, VENTING, AND STORM DRAIN PIPING

A. Below Grade: Extra heavy weight, coated cast iron soil pipe, hub-&-spigot, ASTM A 74, with TY-seal double seal, premolded one piece Neoprene compression type gasket, ASTM C 564, or lead/oakum joint materials, FSQQ-C-40.
   1. Service weight "No-Hub" cast iron soil pipe, FS WW-P-401, with Neoprene gasket, ASTM C564, and stainless steel drawband.
   2. Where permitted by plumbing and building codes, schedule 40 Polyvinyl Chloride sewer pipe (PVC), ASTM D 2729, with sewer fittings ASTM D 2729, and solvent cement, ASTM D 2564.

B. Above Grade: Service weight cast iron soil pipe, Hub-&-Spigot, ASTM A 74, with premolded one piece Neoprene compression type gasket, ASTM C 564, or lead/oakum joint materials, FS QQ-C-40.
   1. Service weight "No-Hub" cast iron soil pipe, CISPI standard 301, or FS WW-P-401, with Neoprene gasket, ASTM C564, and stainless steel drawband, comforming to CISPI standard 310.
   2. Where permitted by plumbing and building codes, schedule 40 Polyvinyl Chloride (PVC), type DWV, ASTM D 2665; with schedule 40 DWV fittings, ASTM D 2665 and patterns conforming to ASTM D 3311. Solvent cement, ASTM D 3138.

C. Provide a copy of the plot plan showing exact locations of all underground services direct to the engineer with accurate dimensions from the building such that all the underground service can be located.

D. Before building footings are formed, this contractor shall start excavating for sewer services and shall confirm that depth of existing sewer is such that the building sewer services will drain into it by gravity. If existing sewer is not deep enough, the contractor shall notify the engineer at once.

2.5 DOMESTIC WATER (COLD, HOT, & RECIRCULATING HOT WATER) IN BUILDING ABOVE GROUND

A. Piping shall by Type “L” hard drawn copper water tube. Fittings wrought copper, solder joints. Joints 95-5 or lead free solder.

B. Uponor PEX-A potable water piping system with Uponor expandable F1960 fittings (no crimp fittings to be accepted) provided the contractor is trained and following all manufacturer’s recommendations thus fulfilling all available Uponor warranty coverage.

2.6 NATURAL GAS ABOVE GROUND

A. Steel Pipe: ASTM A 53; Type E, electric resistance welded or Type S, seamless; Grade B; Schedule 40; black.

B. Viega MegaPress fittings may be used above grade provided contractor is trained and following all the manufacturer’s recommendations and requirements to fulfill all the available warranty coverage.

C. Install gas shut-off valves & pressure reducing valves to isolate all equipment.

D. Install 6” traps (drip legs) prior to gas shut-off valves for all equipment controls. See LP Gas Connection Detail on plans.

E. All gas piping to comply with AGA and NFPA National Fuel gas Code recommendations and comply with all requirements of the utility supplying the gas.

F. All piping routed on roofs shall have premanufactured roof blocks with Unistrut support, wood blocking and pipe straps will not be acceptable.

G. All gas piping in concealed locations shall be welded or shall be CSST.

2.7 COMPRESSED AIR & FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black with ends threaded according to ASME B1.20.1.
   1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
   2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
   3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
   4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
   5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
   6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
   7. See detail for Quick Connects, confirm layout with Owner prior to installation.

2.8 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.10 SLEEVES

A. The following materials are for wall, floor, slab, and roof penetrations:
   1. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
   2. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
   3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
   4. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.11 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

2.12 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.13 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.
   6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   5. Equipment to Be Removed: Disconnect and cap services and remove equipment.

6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Do not run piping through electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces, if approved by local authority.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping to permit valve servicing.

H. Install piping to allow maximum possible headroom unless specific mounting heights or slopes are indicated.

I. Install piping at indicated slopes, or level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install piping to allow application of insulation.

M. Select system components with pressure rating equal to or greater than system operating pressure.

N. Install escutcheons for penetrations of walls, ceilings, and floors.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials conforming to the 25/50 flame spread and smoke developed rating.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

END OF SECTION 22 0510

SECTION 22 0700
PLUMBING SYSTEMS INSULATION

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. The work in this section of the specification and the accompanying drawings consists of performing all labor, equipment, accessories, and materials and in performing all operations necessary for the installation of all insulation for the plumbing, circulating hot water heating piping systems, and sealing of sleeves.

B. Work to be insulated includes the following:
   1. All domestic cold water piping, valves, and fittings.
   2. All domestic hot & recirculating hot water piping, valves, and fittings.
   3. All roof drain bodies, vertical and horizontal storm drainage and rainleader piping completely down to connection at downspout nozzle.
   4. All sleeves.

C. All insulation work shall be installed in a workmanlike manner by skilled workmen engaged in this type of work.

D. Fire-Test-Response Characteristics: Provide products with flame-spread and smoke-developed indices of 25 and 50, respectively, according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

1.3 SUMITTALS

A. Shop drawings/product data as specified in Section 22 0500 shall include the following:
   1. Product Data: Identify thermal conductivity, thickness, and jackets (both factory installed and field applied, if any), for each type of product indicated.

1.4 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate size and location of supports, hangers, and insulation shields.
   1. All hangers and insulation shields for piping shall be large enough to encompass insulation without penetrating vapor barrier.
   2. It shall not be acceptable for insulation to envelope hangers/saddles.
   3. It shall not be acceptable for insulation to terminate on either side of hangers not properly sized to encompass insulation.

PART 2 - PRODUCTS

2.1 NEW DOMESTIC COLD, HOT, & RECIRCULATING WATER PIPING INSULATION

A. All piping in concealed and exposed areas shall be insulated with fiberglass pipe insulation with all service jacket. Jacket shall be factory-applied, and, where specified, with white foil scrim-kraft vapor barrier. Insulation shall be Johns-Manville Micro-Lok 850 APT, or accepted equal.

B. For pipe sizes 1” and less – insulation thickness shall be ½”. For pipe sizes of 1-1/4”-2” – insulation thickness shall be 1”. For pipe sizes of 2-1/2” and larger – insulation thickness shall be 1-1/2”.

C. Fittings, valves, flanges, etc. shall be insulated with fiberglass blanket, Johns-Manville Microlite or pre-cut mitered sections for elbows, J-M Micro-Lok (1lb/cu. ft. density).

D. Encase pipe fitting insulation with one piece pre-molded PVC fitting covers having flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.

E. See plumbing plans in kitchen for required locations of PVC .020” jacketing on piping insulation.

F. Provide sheet metal insulation shields at all hanger locations.

2.2 NEW STORM PIPING AND ROOF DRAIN BODIES

A. All piping in concealed and exposed areas shall be insulated with fiberglass pipe insulation with all service jacket. Jacket shall be factory-applied, and, where specified, with white foil scrim-kraft vapor barrier. Insulation shall be Johns-Manville Micro-Lok 850 HP, or accepted equal.

B. For all pipe sizes and drain bodies – insulation thickness shall be 1" and be fully vapor sealed.

C. Fittings, valves, flanges, etc. shall be insulated with fiberglass blanket, Johns-Manville Microlite or pre-cut mitered sections for elbows, J-M Micro-Lok (1lb/cu. ft. density).

D. Encase pipe fitting insulation with one piece pre-molded Zeston 2000 PVC fitting covers having flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.

E. Provide sheet metal insulation shields at all hanger locations.

F. Hangers for piping shall be large enough to encompass insulation. It shall not be acceptable for insulation to envelope hangers/saddles, or for insulation to stop on either side of hangers.

PART 3 - EXECUTION

3.1 GENERAL APPLICATION

A. All insulation shall be applied on clean, dry surfaces. All joints shall be snugly butted against the adjoining piece and all joints, seams, voids, flat spots, etc., shall be filled with insulation cement. Do not use cut pieces or scraps abutting each other.

B. Where double layers are installed, the first layer shall be fastened with binding wire. All joints shall be staggered between the two layers.

C. Insulation on all cold surfaces must be applied in a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.

D. All surface finishes shall be extended to protect all surfaces, ends, and raw edges of insulation.

E. All insulation materials shall be installed in strict accordance with manufacturer's instructions, using recommended adhesives, mastics and coatings applied at specific coverage per gallon and temperature conditions.

F. Extend insulation without interruption through walls, floors and similar penetrations, except where otherwise indicated.

G. Maintain integrity of vapor-barrier jackets on insulation, and protect to prevent puncture or other damage.

H. Do not apply insulation to equipment, breechings, or stacks while hot.

I. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

J. Provide removable insulation sections to cover parts of equipment, which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

K. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

L. Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.2 MINERAL-FIBER PIPE INSULATION APPLICATION

A. Fittings, valves, and flange insulation shall be wrapped firmly under compression (minimum 2:1) to a thickness equal to the adjoining insulation, secured with No. 20 gauge galvanized annealed steel wire, and finished with a smoothing coat of mastic, Johns-Manville No. 375 Insulating and Finishing Cement or equal.

B. Cold Fittings, Valves, Flanges, etc., shall be additionally sealed with a layer of resin coated glass mesh, such as Johns-Manville Duramesh 207 glass cloth, embedded between two 1/16" thick coats of vapor barrier coating, Benjamin Foster 30-35 or equal. Lap the sealed glass cloth at least 2" on itself and the adjoining insulation.

C. Premolded Insulation Valve and Fitting Covers shall be installed by tack fastening, banding, or taping as required by manufacturer.

D. Expansion Joints: For expansion joints, a tube of pipe insulation shall be fabricated that will allow the expansion joint to move within the tube. The insulating tube shall be fastened at one end of the pipe or equipment and the other end shall be free to slide over the adjacent insulated piping. Provide an aluminum jacket over the insulated pipe to provide a smooth surface on which the insulated tube may slide.

E. Insulation Under Hangers: Pipe hangers shall encompass the insulation and shall have sheet metal saddles furnished by the Mechanical Contractor.

F. Inserts shall be installed at all hanger locations. Inserts between the pipe and pipe hangers shall consist of 13lb/cubic foot hydrous calcium silicate pipe insulation, or wood blocking, of thickness equal to the adjoining insulation and shall be provided with vapor barriers where required. Insulation inserts shall not be less than the following lengths:

1.	½" to 1-1/2" pipe size	10" long
2.	3" to 6" pipe size	12" long
3.	8" and larger pipe size	16" long

G. On all piping the full thickness of insulation and jacket shall run continuously under the sheet metal pipe saddle and through the pipe hanger (pipe hanger shall be large enough to permit full insulation thickness.)

3.3 SEALING OF SLEEVES

A. All sleeves for pipes, ductwork, etc., furnished under Division 22 of specifications, penetrating floors, fire and/or smoke walls and full height partitions, including chase walls, shall be sealed in accordance with the following:

1. All insulated services shall have the specified insulation terminated on either side of sleeve. Services which require a vapor barrier jacket shall have segment through sleeve insulated with calcium silicate having a minimum thickness same as specified for service. Vapor barrier jacket shall be uninterrupted. Entire void space between inside of sleeve and outside of duct, pipe, and/or calcium silicate insulation shall be packed with fiber insulation, conforming to HHI-521E Type 3 or HHI-558B Form A and having an ASTM fire class E-84 with fiber melt point in excess of 2000 degrees F., to a point 1/8 inch from ends of pipe sleeve. After void is packed with fiber insulation, services which are specified to be insulated shall have a section of insulation installed on each side of sleeve, insulation to be fitted tight to sleeve insulation. Balance of space in sleeve to be filled with nonhardening silicone conforming to TTS-00230 and of type which will allow 50 percent movement in one direction.
2. Contractor is herein given the option to provide Pipe Shield, Inc., fire rated wall and floor sleeves for insulated and noninsulated piping in lieu of sealing sleeves as outlined above. Shields shall be installed in strict accordance with manufacturer's recommendations.

END OF SECTION 22 0700

SECTION 22 4000
PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work in this specification and the accompanying drawings consists of performing all labor and furnishing of all material and equipment necessary to install complete systems listed below, including minor items obviously necessary for complete and operating systems.
   1. Plumbing Fixtures
   2. Soil, Waste, Sanitary Drainage, and Vent Piping
   3. Storm Drainage System
   4. Natural Gas Piping Systems
   5. Compressed Air Systems

B. The plumbing work shall be installed in strict accordance with all applicable local, state, national plumbing regulations, and authority having jurisdiction.

C. Also included is the work involved to remove & relocate existing associated equipment, remodeling of existing systems, including connections between new and existing systems.

1.3 SUBMITTALS

A. Shop drawings as specified in Section 22 0500 shall include the following:
   1. Domestic Water/Fire Sprinkler Service Stub Out Piping
   2. Domestic Water System Piping, Valves, and Fittings
   3. Domestic Water Meterfits & Dual Check Backflow Preventers
   4. Sanitary Waste & Vent System Piping and Fittings
   5. Storm Sewer System Piping and Fittings
   6. Natural Gas System Piping, Valves, Fittings, Roof Supports
   7. Natural Gas Pressure Reducing Valves
   8. Prior to final inspection, Air Compressor Manufacturer's Factory Authorized Start-up Procedures and Checklist
   9. Compressed Air Piping, Valves, Fittings, & Quick Connects
   10. Plumbing Fixtures
   11. Floor Drains
   12. Floor Sinks
   13. Interior & Exterior Cleanouts
   14. Roof Drains
   15. Shock Absorbers & Mfgr's Recommended Locations to be Installed
   16. Natural Gas Fired Domestic Water Heater
   17. Domestic Hot Water Recirculation Pump
   18. Domestic Water System Expansion Tank
   19. Digital Water Tempering System
   20. Kitchen Hot Water Softener
   21. Drain Valves with Chained Caps

PART 2 - PRODUCTS

2.1 GENERAL

A. Before proceeding with this part of the work, the Contractor shall carefully survey the existing conditions, and, if necessary, modify the service installation, in order to avoid unforeseen obstructions such as in the floor ductwork, etc. This Contractor shall include all costs for this work, including saw cutting & patching, permits, etc., in his bid.

2.2 DOMESTIC/FRE WATER SERVICE STUB OUT

A. Provide new water service stub out as indicated on the plans. Provide minimum 7'-0" of cover over water line outside of building. Provide & install water meter(s) as shown on the plans and in accordance with the manufacturer's recommendations. **PC to provide City approved water meters, coordinate meter requirements with the City of Willow Lake.** Make all arrangements with Water Department and comply with all requirements.

B. Furnish and install sleeves, thrust blocks and/or tie-rods in accordance with the local water department standards and regulations.

C. Install dual check back flow prevention assembly(s) suitable for continuous pressure application. Include shutoff valves on inlet and outlet, strainer on inlet, and test cocks with two positive seating check valves. Manufacturer and model shall be as specified on plans or approved equal.

D. Before proceeding with this part of the work, the Contractor shall carefully survey the existing conditions, and, if necessary, modify the service installation, in order to avoid unforeseen obstructions, such as telephone cables, cisterns, electrical conduits, large tree roots, existing water and sewer lines, flag pole bases, etc. This Contractor shall include all costs for this work, including street and sidewalk repair, permits, etc., in his bid.

2.3 NATURAL GAS SYSTEM PRESSURE REDUCING VALVES

A. See section 22 0510 Basic Plumbing Materials and Methods for Piping Specifications.

B. Furnish and install gas pressure reducing valves where shown on plans per manufacturer's recommendations. Type and size shall be as shown on plans. Confirm equipment pressure requirements prior to ordering.

C. Natural gas pressure reducing valves shall have venting per manufacturer's recommendations as required by NorthWestern Energy.

D. Provide isolation valves as shown on plans.

2.4 AIR COMPRESSOR SYSTEM COMPONENTS

A. Air Compressor

1. One (1) Quincy Max Package Model QT-5 – Two Stage Reciprocating Air Compressor with 208/3/60 5HP 80 Gal. Vertical Tank. Simplex Reciprocating Air Compressor, rated at 17.2 acfm at 175 psig. The tank mount unit is built on an 80 gallon tank and powered by a 5 hp, 208/3/60, ODP, standard efficiency motor with the compressor operating at 942 rpm.
2. *Optional Equipment:*
   a. Air Cooled Aftercooler ----------Included
   b. Vibration isolators: pad ----------Included
   c. Low oil level switch ----------Included
   d. Extended 2 year warranty kit----------Included
      1) Kit includes two replacement air filters and and two replacement oil filters.
   e. Control Panel Type - Simplex Magnetic Motor Starter----------Included
   f. One spare belt for compressor.
   g. Tank drain valve with automatic timer.

B. Air Dryer

1. One (1) Quincy Air Dryer QPNC-21, non-cycling, air-cooled, 115/1/60, refrigerated air dryer.

C. Filters

1. One (1) Quincy QWS Series QWS-35 Moisture Separator, 3/8" npt, general purpose, compressed moisture separator.
2. One (1) Quincy General Purpose QMF Series QMF-32 Filter, 3/8" npt, high efficiency, oil removal, compressed air filter with one (1) replacement element.

D. Flex Connector

1. One flex connector.

E. Air Regulator

1. One relieving regulator, 0-125 psi adjustable.

F. Prior to final inspection, factory authorized start-up of the Air Compressor System will be required. Air Compressor Manufacturer shall provide the services of a factory trained representative who shall supervise all final preparation for start-up, inspect the complete installation, make necessary final adjustments, and instruct the Owner's personnel in the proper operation and maintenance of the equipment. Factory authorized start-up documentation to be submitted to the engineer prior to final inspection.

G. Compressed air quick connects – provide Style to match owner's exg. Equipment, verify with owner prior to ordering.

H. Hose Reels

1. See plans for make model & quantity.

2.5 PLUMBING FIXTURES

A. Furnish and install plumbing fixtures where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Where indicated on the drawings to be a future fixture, this contractor shall provide all waste, vent, and water supplies as indicated on the drawings and according to local code.

C. Exposed flush, waste, and supply pipes at the fixtures shall be chromium plated brass pipe, iron pipe size. Fittings for brass pipe shall be cast brass, chromium plated.

D. Install chromium plated wall or floor plates (escutcheons) with set-screw where piping passes through walls or floors.

E. All handicap lavoratories supply pipe and drain pipe will be fitted with removable safety covers that comply with handicap code requirements.

F. All fixtures fitted to the walls or floors shall be ground and true and be sealed with a non-hardening white silicone caulk bead.

G. All plumbing fixtures shall be supported per manufacturer's recommendations.

2.6 FLOOR DRAINS

A. Furnish and install floor drains where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings. Connect outlet of drain to "P" trap. Venting installation requirements of floor drains whether or not shown on plans shall be according to code and approved by the code official.

B. Furnish and install any floor drains required by the authority having jurisdiction to meet the Uniform Plumbing Code 2009 704.3.

2.7 FLOOR SINKS

A. Furnish and Install floor sinks where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings. Connect outlet of drain to "P" trap. Venting installation requirements of floor sinks whether or not shown on plans shall be according to code and approved by the code official.

2.8 CLEANOUTS (INTERIOR & EXTERIOR)

A. Furnish and install clean outs where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings. Install proper traffic rating and floor pattern shape for intended use.

B. Cleanouts shall be provided at the base of all vertical stacks with the cleanout plug located approximately 12" above the floor and extended to wall access cover. Cleanouts in floors on grade shall be located as shown on plans and at changes in direction of pipe run and shall consist of Y fittings and eighth bends. Cleanouts must be provided in accordance with the local code and as shown on the drawings.

C. Floor cleanouts – frame and cover threaded for 2" vertical adjustment, threads protected with shield to be removed when concrete is set. Covers-nickel bronze round frame and cover, deep flange tractor type. Extra heavy type in heavy traffic areas, and with carpet cleanout marker for carpeted floors.

D. Wall Cleanouts – access covers shall be stainless steel.

E. Provide exterior ground cleanouts up to grade from sewer mains where service exits the building, as shown on drawing, and using service weight cast iron soil pipe up to grade (regardless of the type of material for the line). If not in concrete, pour an 18"x18"x6" concrete pad around cleanout and install flush with surrounding surface. Cleanout to be Zurn Z-1474-VP Heavy Duty Cleanout with dura-coated cast iron top and vandal proof screws or equal by Zurn, Blake, Josam, or Smith.

2.9 ROOF DRAINS & DOWNSPOUT NOZZLES

A. Furnish and install roof drains & downspout where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings

B. Roof drains shall be cast iron body, cast iron dome, sump receiver, underdeck clamp, and no-hub outlet.

C. Installation shall be as per manufacturer's recommendations.

D. Provide & install concrete splash blocks below downspout nozzles.

E. Coordinate finished grade elevations with site contractor. Downspout nozzles to be installed 18" above grade.

2.10 ROOF JACKET

A. Roof extension from soil, waste, and vent pipes shall be extended at least 18 inches above the roof, and must be encased in frostproof jackets, each having an air space at least 1" between the outside surface of the pipe and a cap over the top of the pipe so that it will be unnecessary otherwise to plug the inside of the vent pipes at the top when the test is made. These plugs must be of a type readily seen until removed. Remove them at once after the piping system has been tested and approved.

2.11 NATURAL GAS FIRED DOMESTIC WATER HEATER

A. Natural gas water heater(s) shall be HTP PH199-119 model as specified, minimum 95% thermal efficiency, a storage capacity of specified gallons, an input rating of specified BTUs per hour, a recovery rating of specified gallons per hour (gph) at 100°F rise and a maximum hydrostatic working pressure of 160 psi.

B. The heater tank shall be constructed of 316L stainless steel. The primary condensing heat exchanger shall be constructed of 90/10 cupronickel. The secondary heat exchanger shall be constructed of 800H stainless steel and 90/10 cupronickel. Solar models shall have an additional heat exchanger on the bottom of the tank to connect to a solar system.

C. Tank insulation shall be 2" thick water blown foam. Insulation shall be enclosed in a plastic jacket. All components shall be located on the front of the heater for easy service access. All related hardware shall be constructed of stainless steel studs with brass nuts. All water connection nipples shall be constructed of stainless steel and attached to the side of the tank. Multi Fit models shall have additional top mounted piping connections to increase installation flexibility. The top and bottom of the tank shall be smooth.

D. The water heaters shall be ETL listed and certified to ANSI Z21.10.3-CSA 4.3 standard governing storage tank water heaters with input ratings above 75,000 BTU/Hr. Water heaters shall exceed the minimum thermal efficiency and standby loss requirements of the United States Department of Energy and current edition of ASHRAE/IESNA 90.1. All heaters will be supplied with a factory installed ASME rated temperature and pressure relief valve, a low water cutoff, a high temperature switch, an upper hot water sensor, a lower cold water sensor, and a condensate trap assembly ready for easy connection to a field supplied condensate drain.

E. The heater shall have an integrated digital controller device with integral diagnostics, LED fault and temperature settings for establishing set point and temperature differential. Ignition shall be direct spark and take place at a speed pre-set for the burner blower. The control shall utilize an algorithm to fully adjust the burner modulating firing rate while maintaining the desired temperature. In Sanitizer models, the controller is set to provide 184oF operating temperature with an adjustable 2oF differential to maintain temperature for sanitation purposes. The pre-mix stainless steel burner uses a 120 volt motor with pulse wave modulation control to change the fan speed, thus the combustion air volume of fuel and air through the burner to establish a continuous BTU input range equal to the water heating set point requirement. The digital LED control display shall provide means, via push buttons, for adjustments of operating temperatures, differential adjustment, ECO reset, service mode, and real time status mode. The control shall have low voltage inputs to accept a 0-10 volt from a building management system or outdoor sensor to alter the set point of the water heater. The unit will also have line voltage outputs for connection to a condensate pump and alarm output that will alert user of fault in the water heater for service. In addition, there shall be provided a computer connection for history, including all fault codes and hours of operation above 50% input, below 50% input, as well as real time status reporting of all operations. The burner assembly shall be mounted so as to be easily removed as an integral unit for ease of service.

F. The heater combustion system shall be designed for either two pipe (intake and exhaust) closed combustion, or a single pipe system taking mechanical room air and piping exhaust outside. Schedule 40 or 80 PVC or stainless steel piping materials are approved for venting applications **(NOTE: Foam core pipe is not an approved exhaust venting material.)**

G. The heater shall be in compliance with the NOx emissions limit set forth in SCAQMD Rule 1146.2. The heater shall be factory assembled, test-fired for correct BTU input, and adjusted for proper combustion parameters. Complete operating and installation instructions shall be furnished with every heater as packaged by the manufacturer for shipping.

H. The surfaces of these products contacted by consumable water contain less than 0.25% lead by weight, as required by the Safe Drinking Water Act, Section 1417.

2.12 DOMESTIC HOT WATER RECIRC PUMP

A. The contractor shall furnish and install inline pump as illustrated on the plans and in accordance with the following specifications:
   1. The pump shall be of the horizontal, permanently lubricated type, specifically designed and guaranteed for quiet operation.
   2. The pump 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 to be carbon on silicon carbide. The motor shall be non-overloading at any point on the pump performance curve.
   3. 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.
   4. Pump to be suitable for 225°F (107°C) operating temperature at 150 psig (10 bar) working pressure.

2.13 DOMESTIC WATER SYSTEM EXPANSION TANK

A. Furnish and install a pre-pressured expansion tank as scheduled on the drawings or prior approved equal.

2.14 DIGITAL WATER TEMPERING SYSTEM

A. Temperature control system shall be controlled digitally via integrated circuit board technology designed to deliver blended water economically at accurate temperature selected by user as safe and appropriate for sanitary use in facility's recirculated hot water system. The mixing valve shall be a Watts Intellistation Jr. with model as noted on plans.

B. Construction shall be lead free design and in compliance with lead free laws. Digital water temperature control and monitoring system shall feature full-color touchscreen interface capable of displaying critical system data in standard or metric measurements. Unit shall be

user-configurable on location and shall not require factory pre-programming prior to shipment. Temperature adjustment shall be made locally by user at the control module and shall not require a laptop computer or special software to initiate. BAS to monitor and override.

C. System shall control water temperature to +/- 2°F in accordance with ASSE 1017 and during periods of low and zero demand, and maintain a consistent system "idling" temperature to mitigate "temperature creep" without the use of a manual throttling device/balancing valve. The high-speed actuator shall be located external to mixing chamber where water from valve cannot affect performance as a result of faulty o-rings or seals.

D. System shall feature Feed Forward or Predictive Control which anticipates changes in system demand and adjusts valve pre-emptively to maintain mixed set point. Control module shall be password protected to help prevent unauthorized adjustment or tampering with settings.

E. System shall digitally monitor and display the following without the use of an external module, laptop and special software that must be downloaded:
   1. Mixed outlet temperature and mixed outlet set point in oF/oC

F. Control module shall integrate with building automation systems through BACnet and/or Modbus protocols without the use of a separate module, and feature local and remote temperature alarms. System will also feature a password protected, user-selected high-temperature sanitization mode for operation as part of a user's safe and properly designed thermal bacteria eradication protocol.

G. In the event of a power failure or loss of cold water, system will close the hot water supply via an internally charged capacitor and is not reliant on batteries which must be replaced. Actuator shall also feature a manual override which can be used to set mixed outlet temperature in the event of a power loss.

H. System shall be listed/approved to ASSE 1017, cUPC, NSF and CSA 24/UL873. System shall come with a standard 5-year limited warranty.

I. Provide & install unions as shown on piping detail to facilitate simple unit removal for maintenance.

2.15 KITCHEN HOT WATER SOFTENER

A. Furnish and install a Hot Water Softener system as scheduled on the drawings or prior approved equal. System shall be capable of a continuous flow rate of 5.0 gpm minimum with a maximum 10 psi continuous flow pressure drop.

B. The system shall:
   1. Be rated for at least 140°F minimum feed water temperature.
   2. Utilize a structural FRP vinyl-ester 10% minimum crosslinked resin tank.
   3. The control valve will be of all-brass construction, with a stainless steel bypass valve.
   4. Be provided with a 7-day automatic regeneration controller and pre-wired power cable.

C. Install piping adjacent to equipment to allow service and maintenance.

D. Make piping connections between water-softener-unit headers and dissimilar-metal water piping with dielectric fittings.

E. Install shutoff valves and unions on raw-water inlet and soft-water outlet piping of each mineral tank, and on inlet and outlet headers.

F. Install drains to spill into floor sink.

G. Install pressure gauges and sampling ports on raw-water inlet and soft-water outlet piping of the mineral tank.

H. Install a vacuum break between the softener and the potential cause of a vacuum anytime a vacuum situation may occur.

2.16 SHOCK ABSORBERS

A. Piping shall be installed with proper safeguards to prevent water hammer. This will be done by installing a sufficient number of shock absorbers. Shock absorbers shall be Watts or equal.

B. Contractor to indicate installed locations on as-built drawings.

2.17 MISCELLANEOUS CONNECTIONS

A. Make all domestic water, waste, vent, gas, air, etc., connections to all equipment in this building whether or not such equipment is furnished under this section or under other sections of the specification. This includes furnishing piping, traps (if required) and shut-off valves on branches to and from each piece of equipment from mains or branch mains.

B. Make all plumbing connections to existing piping and to all equipment shown on the plans as requiring same. If specific piping details are not shown, the equipment shall be roughed in for and connected in accordance with the manufacturer's recommendations. It will be this contractor's responsibility to obtain shop drawings from whomever furnishes the equipment.

2.18 TESTING/CLEANING

A. The mechanical contractor is responsible for the testing & cleaning of each respective system in accordance with applicable state and local codes. Tests shall be repeated until each system is proven acceptable.

END OF SECTION 22 4000

SECTION 23 0500
GENERAL HVAC 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.

1.2 SUMMARY

A. The mechanical contractor shall perform all work and furnish all materials as indicated in the mechanical plans and specifications as necessary for the successful completion of this project.

1.3 PERMITS AND SERVICES

A. The mechanical contractor shall obtain all permits and arrange all inspections, give notices and pay all fees as required by the Authority Having Jurisdiction.

B. This contractor shall coordinate any necessary site utilities including water, natural gas, and sewer work with local utility, owner, and other contractors to minimize disruption and downtime. Clarification to the Bidding - Any natural gas utility costs from Northwestern Energy will be paid directly by the owner and shall not be included as part of this contract. WITH THE EXCEPTION OF THE NATURAL GAS, ANY AND ALL CHARGES ASSESSED BY THE UTILITY OR CITY TO ACCOMMODATE THE REQUIREMENTS OF THIS PROJECT ARE THE SOLE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. VERIFY ALL CHARGES AND COORDINATE ALL EQUIPMENT NECESSARY WITH THE UTILITY BEFORE SUBMITTING BID.

1.4 DRAWINGS AND MEASUREMENTS

A. Verify all dimensions and conditions with Architectural and Structural drawings. The small scale of the drawings prohibits the indication of all offsets, fittings and accessories necessary and shall be furnished by this Contractor and required for complete and proper operation.

B. “Existing Conditions” shown on drawings are based on existing plans and limited field investigation. The field survey was conducted to verify, as much as possible, the accuracy of the locations shown. The Contractor shall verify the accuracy of the “Existing Conditions” as shown on the drawings. As the demolition work progresses perform modifications and additions as necessary to correct for these hidden conditions and allow for the completion of the new work.

C. The general arrangement of the mechanical systems shall be as shown on the drawings. Field changes shall have the written acceptance of the Engineer.

D. Consult the drawings and specifications of all other trades. Layout work and coordinate with other trades, before installing any equipment, to avoid interfering with these trades or conflicting with applicable codes.

E. The mechanical contractor shall bear full responsibility for coordinating his work with other trades to avoid conflicts in space requirements, clearances, etc. Problems arising due to lack of coordination will be the responsibility of the mechanical contractor to resolve. Extra work and/or equipment as a result of not coordinating work shall be the responsibility of the installing contractor and at no cost to the Owner.

1.5 INSPECTION OF SITE AND DOCUMENTS

A. Before submitting a proposal on the work contemplated, the bidder shall thoroughly familiarize himself with the contract documents, the site, and all existing conditions and limitations that may affect the performance of his work. Any conflict noted shall be brought to the attention of the Engineer before bidding. If there is not sufficient time prior to bidding, the Contractor shall bid the larger quantity or better quality of work.

B. No extra compensation will be allowed, because of misunderstanding the amount of work involved or the bidder's lack of knowledge, for obvious conflicts which could have been discovered or reasonably anticipated prior to bidding.

1.6 REGULATIONS AND CODES

A. All work, materials, and equipment in this contract shall comply with all applicable local, city, state and federal ordinances, regulations, and codes.

1.7 INSTRUCTIONS

A. Furnish verbal and engineer approved written instructions to Owner on all systems. Instruction shall include operating procedures, adjustments, and periodic maintenance. Furnish a copy of the written instructions and attach a letter to the Engineer, prior to final inspection, signed by Owner, attesting to date and satisfaction of instructions.

1.8 OPERATING AND MAINTENANCE MANUALS (3 Hard Copies & 1 Electronic Submittal via Submittal Exchange)

A. PRIOR TO FINAL INSPECTION, The mechanical contractor shall furnish (3) hard copies (including 1 USB drive containing electronic copy) and (1) electronic submittal via Submittal Exchange of the O&M Manuals to the Engineer, containing all pertinent data to the mechanical systems. Information shall be indexed and labeled per system and shall include catalog cuts, installation manuals, maintenance manuals, manufacturer's names, replacement parts list. Include balancing reports as specified. Include written instructions and warranty info as specified.

B. The first section shall be indexed/labeled "WRITTEN INSTRUCTIONS & TRAINING" noting written instructions with company service contact info and shall include a list of filters for each unit. Also include document with owners signature attesting to date and satisfaction of training.

C. The second section shall be indexed/labeled "WARRANTY INFO" and shall include a statement of guarantee on the contractors company letter head and shall include warranty statements of all equipment provided/installed under his contract with specific dates. This will note any longer/special warranties.

1.9 AS-CONSTRUCTED DRAWINGS (Red Lined on Plans & USB Drive containing scanned PDF)

A. During construction, each trade shall keep track of the major changes in the rerouting of piping and equipment, and shall note these in red on one set of drawings. This set of drawings shall be submitted with the Operation and Maintenance Manuals along with a USB drive containing a single PDF file with these same red line plans in electronic form. Most printing shops will be able to scan your trade's large plan sheets into electronic form. Contact the engineer's office if there are any questions.

1.10 WORKMANSHIP

A. Qualified individuals that are properly licensed to perform the work involved shall perform all mechanical work.

1.11 CUTTING AND PATCHING

A. This Contractor shall be responsible for all cutting and patching of holes required for passage of piping, equipment, and ducts. This also applies to the removal or installation of new equipment.

B. All cutting of existing construction required to install or join new work, except where otherwise indicated on the plans, shall be the responsibility of this Contractor and coordinated with the General Contractor. Before making any cuts, verify exact locations and sizes with the General Contractor to confirm that no structural members will be cut. Contractor shall make every effort to minimize extent of cutting existing construction.

C. The mechanical contractor shall be responsible for patching any openings left in floors, walls, and ceilings that were caused by his/her actions. Patching shall match existing surface in color, texture and quality so that patch is indistinguishable from original surface.

1.12 PAINTING

A. Any equipment which becomes rusted or damaged during construction shall be repaired, cleaned, and repainted by this Contractor. Painting shall always be applied in two coats, one primer and one finish.

1.13 EQUIPMENT AND PIPE SUPPORTS

A. Provide all structural supporting frames, steel stands, concrete bases, and hangers as required for mechanical equipment. All floor equipment shall be set on 4" high concrete bases furnished by this Contractor, unless otherwise noted.

B. Paint all unprotected metal, except galvanized and copper, with metal protective paint.

C. Hangers for piping shall be large enough to encompass insulation. It shall not be acceptable for insulation to envelope hangers/saddles, or for insulation to stop on either side of hangers.

D. Provide saddles at all hangers or supports of insulated piping. Saddles for 4" and larger piping shall be fabricated of 14 gauge galvanized iron, and for smaller piping shall be fabricated of 16 gauge galvanized iron. Saddles shall be one-half the circumference of the pipe insulation and 4" shorter than the insulation inserts.

E. Under no condition shall any pipe or duct structure be used to support another.

1.14 ACCESS TO EQUIPMENT

A. 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.

B. Access openings are required for manual, motorized, fire, and smoke dampers and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, etc., under this portion of the contract.

1.15 EXCAVATING AND BACKFILLING

A. When work to be completed by this contractor requires trenching, digging, etc. this contractor shall be responsible for properly protecting open trenches in accordance with required safety procedures. Backfill shall be placed in horizontal layers, not exceeding 9 inches in thickness. Moisten and hand or machine compact to 95% of standard proctor density. Bring fill to elevations indicated. If backfill fails the proctor density test in accordance with ASTM D-2049 and conducted by an independent testing laboratory retained by the owner, Contractor shall recompact and retest until satisfactory density is reached. This contractor shall restore the surface (whether grass, asphalt, concrete, etc.) to its original condition. Grass shall be seeded to match surrounding turf.

B. When work is in public street, paving repairs shall be equal to and comply with municipal agency requirements. If repairs are done by municipal agency, make necessary arrangement with such agency to make the repairs. Contractor shall include cost for permits, inspection fees, work, etc. in Mechanical Bid.

1.16 TESTING AND ADJUSTING

A. At the completion of work, all parts of the installation under Division 23 shall be cleaned, lubricated, tested, and adjusted for proper operation.

B. All piping and ductwork shall be tested and cleaned as required, by all local, state and federal codes. Tests shall be performed in the presence of the authority having jurisdiction. Written notification of test, date, and results shall be furnished to the Engineer before concealing or covering the installation.

C. All controls shall be tested and adjusted for proper operation. Adjustments shall be made when all systems are operating which may affect the control system.

D. An Independent Testing & Balancing Agent shall test and balance all mechanical systems as specified in Section 23 0593.

1.17 GUARANTEE

A. Warranty: The mechanical contractor shall warrant his work against failure and workmanship for a period of at least one year from the date of substantial completion, for all new work. Any work that is defective within that one-year period shall be replaced by the Contractor without charge. If longer/special warranties are noted elsewhere in the specifications, those warranties shall apply.

1.18 EQUIPMENT IDENTIFICATION

A. Major mechanical equipment, rooftop units, energy recovery ventilators, electric duct heaters, heat pumps, exhaust fans, etc. shall be provided with identification as designated on the plans. Labels shall be black laminate three-layer plastic with engraved 1/2 inch white letters, adhered, screwed, or riveted to the equipment. Manufactured by Brady, Champion America/Seton.

B. Piping shall be identified as to contents and flow direction with plastic, color coded, snap-on or adhesive labels. Manufactured by Brady, Champion America/Seton.
   1. Labeling shall be located:
      a. Adjacent to each valve.
      b. At each side of and at each obstruction.
      c. At each branch.
      d. At each cap for future.
      e. At each takeoff.
      f. At each side of penetration of structure or enclosure.
      g. At each equipment connection.
      h. At all access doors.
      i. A maximum of every 40 feet on straight runs of piping including rises and drops.
      j. Minimum one label per room/space.

C. Valve tags shall be brass with stamped letters, tag size 1-1/2” minimum in diameter.
   1. Provide typed valve lists in each O&M binder. Valve lists shall include the valve number, location, and purpose of each valve, and any other necessary information such as the required opening or closing of another valve when one valve is to be opened or closed.

D. Color coded indicators shall be installed on the ceiling grid or access door to hard lid areas to indicate all valves and other ceiling mounted equipment requiring service (example – VAV’s). Each trade shall be responsible for equipment provided under their respectable trade.
   1. Each ceiling label shall be color coded laminated engraved plastic, 1/16” thick, 2.5” wide by 0.75” tall, with white lettering centered on each label. Label to be adhered to the acoustic ceiling tile grid. Seton Style AV0175 or similar.

1.19 MECHANICAL SUBMITTAL

A. All equipment shall be as listed on the equipment schedules or approved equal.

B. Prior Approval: Manufacturers whose product is not specified or specifically listed on the plans or in the specifications are allowed to submit information on a product that they would like to be considered as an equal to those specified or listed. By submitting this information for consideration, the product representative is indicating that the product being presented for consideration equals or exceeds the specified product in quality, performance and operating parameters. Proof of equality rests with the party making the request. The procedure for this submittal is listed below.

C. Submit literature on product that is to be considered for prior approval. This literature shall include catalog cuts with all pertinent technical specifications, dimensions and pictures of the product.

D. Final approval of all equipment shall be contingent on shop drawing acceptance, compliance with the specifications and performance criteria as required. General approval to bid a product does not relieve the supplier or contractor of meeting specific specification requirements.

E. The Mechanical Contractor shall pay, provide, install and be responsible for any extra materials required due to his use of alternate accepted equipment which has installation requirements

different than the specified equipment. This includes paying other trades for any extra work they are involved in due to this substitution of equipment.

F. Literature shall be submitted so that the engineer receives it no later than 7 days prior to bid date.

G. All approvals will be in the form of an addendum issued to all plan holders.

H. List of Acceptable Substitutions:
1. Equipment Identification, Pipe Labeling, Valve Tags, Ceiling Grid Labeling: Seton, Brady Corporation, Marking Services Incorporated
2. Double Wall Pressure Rated Boiler Venting System: Metal Fab, Heat Fab, Duravent
3. Packaged Rooftop Unit with Modulating Natural Gas Heat, Staged DX Cooling, & Powered Exhaust, Single Zone VAV Application (RTU-7): Johnson Controls
4. Packaged Rooftop Unit with Modulating Natural Gas Heat, Staged DX Cooling, & Powered Exhaust, VAV Application (RTU-8): Johnson Controls
5. Packaged Rooftop Unit with Staged Natural Gas Heat, Staged DX Cooling, Hot Gas Bypass, & Powered Exhaust, Single Zone VAV Application (RTU-9): Johnson Controls
6. Packaged Rooftop Unit with Staged Natural Gas Heat, Staged DX Cooling, Hot Gas Bypass, & Powered Exhaust, VAV Application (RTU-10): Johnson Controls
7. Ductless Split System Air Source Heat Pumps: Daikin Applied, Panasonic, LG, Mitsubishi, Fujitsu, Samsung
8. Power Roof Ventilator Exhaust Fans: PennBarry, Greenheck, Loren Cook, ACME, ILG Air Specialties Express/Carnes, Aerovent, Twin City Fan & Blower
9. Science Fume Hood Exhaust Fan: PennBarry, Greenheck, Loren Cook, ACME, ILG Air Specialties Express/Carnes, Aerovent, Panasonic, Twin City Fan & Blower
10. PVC Coated Fume Exhaust Duct:
11. Ceiling Exhaust Fans: PennBarry, Greenheck, Loren Cook, ACME, ILG Air Specialties Express/Carnes, Aerovent, Panasonic, Twin City Fan & Blower
12. Rangehood Exhaust Fans: Broan
13. Intake Hood: ACME, Ruskin, Pottorff, Arrow United Industries, Greenheck, Air Balance, Nailor, NCA, Safe-Air Dowco
14. Motorized Control Dampers: Ruskin, Safe Air, Air Balance, Nailor, Cesco, Advance Air, Air Control Products, International Air, Greenheck, Pottoff, Lloyd, NCA, United Enertech
15. Fan Coil with DX Cooling & Hot Water Heat: Johnson Controls
16. Air Cooled DX Condensing Unit: Fraser-Johnston
17. Slotted Fume Exhaust Hood: Monoxivent, CarMon, Ventaire
18. Portable Dust Collector: Jet
19. Air Cleaners: Blue Ox
20. Registers, Grilles, & Diffusers: Metalaire, Price, Tuttle & Bailey, Krueger, Nailor, Hart & Cooley, Anemostat, Nailor, J & J Register, Air Specialties Express/Carnes, Titus
21. Smoke Dampers: Ruskin, Safe Air, Air Balance, Nailor, Cesco, Advance Air, Air Control Products, International Air, Greenheck, Pottoff, Lloyd, NCA, United Enertech
22. Fabric Duct with Full Length & Circumference Internal Tensioning & Suspension System: DuctSox SkeleCore FTS
23. Exposed Spiral Duct: SPOT, Spiral Pipe of Texas
24. Near-Condensing Boiler-Burner Units: Thermal Solutions EVS (must provide technical submittal minimum 7 days prior to bid opening for consideration)
25. Hot Water Cabinet Unit Heaters: Sigma, Sterlin, Airtherm, Vulcan, Rittling, Modine, Airtherm, IEC
26. Finned Tube Radiation: Sigma, Sterlin, Airtherm, Vulcan, Rittling, Modine, Airtherm, IEC
27. Hydronic Pumps: Armstrong, Taco, B&G, Allis-Chalmers, General Signal Pump Group, Thrush, Patterson, Grundfos, Pentair
28. Hydronic Expansion Tanks: Bell & Gossett, Taco, Wessels, Watts, Armstrong, Thrush, Grundfos, Amtrol, American Wheatley, Elbi, Pentair
29. Hydronic Air Separators: Bell & Gossett, Taco, Wessels, Watts, Armstrong, Thrush, Grundfos, Pentair
30. Bypass Filter Feeders: Vector Industries, Neptune, Wessels

31. Radiant Ceiling Panels: Airtex, Sigma, Sterlin, Airtherm, Vulcan, Rittling, TWA, Price
32. Finned Tube Radiation: Sigma, Sterlin, Airtherm, Vulcan, Rittling, Modine
33. Propylene Glycol: Dow Chemical, Houghton Chemical
34. Pressure-compensating Flow Control and Strainer Valves: Pro Hydronics, Griswold, Autoflow, B&G, Nexus, Flow Design, IMI Flow Design
35. DDC Temperature Controls (BACnet): Delta Controls by Allied Climate Professionals, no substitutions.

1.20 SHOP DRAWINGS

A. Before ordering any item, Contractor shall review, stamp with his approval and submit shop drawings of equipment as to be furnished under this contract.
   1. Electronic submittals are REQUIRED. Electronic submittals can be one combined .pdf. for each of the following mechanical trades: Fire Sprinkler Drawings, Fire Sprinkler Calcs, Fire Sprinkler Materials, Temperature Controls, HVAC, Plumbing, and Hydronics.

B. Where the contractor is submitting shop drawings that differ from the plans and specifications, the contractor must notify the engineer in writing each variance from the plans and specifications and the Mechanical Contractor shall pay, provide, install and be responsible for any extra materials required due to his use of alternate accepted equipment which has installation requirements different than the specified equipment. This includes paying other trades for any extra work they are involved in due to this substitution of equipment.

C. Product Data shall include, but are not limited to, the following: Manufacturer's product specifications, Manufacturer's installation instructions, standard color charts, catalog cuts, roughing-in diagrams and templates, and standard wiring diagrams.

1.21 TEMPORARY HEAT

A. Temporary heating of the building during construction will be provided as specified in the General Conditions and Supplemental General Conditions. Under no circumstance shall the proposed HVAC equipment be brought into service as temporary heating prior to project completion without written permission from the mechanical engineer & owner.

1.22 EXECUTION

A. Remove equipment as indicated. Demolition work shall be coordinated with the Owner. Should questions arise regarding the removal of equipment, confer with the owner before such equipment is demolished.

B. Materials removed by demolition shall remain the property of the Owner unless specifically noted. Material the Owner does not wish to retain shall be removed and properly disposed of by the Contractor.

C. The existing building will be in use during this construction. Schedule and carry out the work in such a manner as to cause the Owner a minimum of inconvenience due to service interruptions. Temporary services shall be installed if one area or phase of construction disrupts service to another area of the building or if equipment has to be relocated to allow construction to progress. Service interruptions shall be confined to the smallest area possible at any one time and interruptions shall be scheduled with the Owners site representative. After service has been restored following an interruption, inspect areas affected by the interruption and be responsible for returning automatically controlled equipment to the same operating condition that existed prior to the interruption.

D. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

F. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

G. Final locations of equipment may differ slightly from those shown on these plans. Coordinate exact location of equipment with equipment supplier, structural members, furniture layout and other trades before rough in and adjust accordingly. Pricing shall allow for a minimum of 10 ft. of difference in the actual location of items as compared to the location shown on the drawings.

H. All penetrations for piping, ductwork, etc. which penetrate floors, fire and/or smoke walls, roofs, full height partitions and similar structures shall be sealed by the mechanical contractor with a UL system specifically approved for the application. This system must maintain the required fire rating.

I. All mechanical systems shall be tested and cleaned as required by Authority Having Jurisdiction.

J. The mechanical contractor shall have the full responsibility of ensuring that his/her work is performed in a safe manner and shall bear all liability associated with his/her job site safety.

K. Upon completion of the work, the Contractor shall notify the A/E and make arrangements for a final inspection. Contactor shall provide A/E with copy of all required balance reports prior to the final inspection.

L. After the final inspection is made, the Contractor will receive a list of items requiring adjustment, correction, replacement, or completion.

M. The Contractor shall comply completely with all listed requirements within (40) days of receipt of list. Should the Contractor fail to perform within this time limit, the A/E and/or Owner reserves the right to have the work completed by others and the cost deducted from the contract price.

END OF SECTION 23 0500

SECTION 23 0510
BASIC HVAC 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.

1.2 SUMMARY

A. This section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Sleeves.
   5. Escutcheons.
   6. Grout.
   7. Concrete bases.
   8. Mechanical Demolition.
   9. Installation requirements common to equipment specification sections.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 QUALITY ASSURANCE

A. All piping shall be specified in this section. Material and installation shall also be subject to state, local codes and ordinances of the area encompassing this project.

B. Delete first paragraph below if no welding. AWS states that welding qualifications remain in effect indefinitely unless welding personnel have not welded for more than six months or there is a specific reason to question their ability.

C. Welder’s Qualifications: All welder shall be qualified in accordance with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

D. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Provide piping and factory fabricated fittings as indicated for each service and pipe size. Fitting sizes and types shall match piping or equipment connections. Where not indicated, comply with governing regulations or manufacturer's recommendations.

2.2 SLEEVES

A. The following materials are for wall, floor, slab, and roof penetrations:
   1. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
   2. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
   3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
   4. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.3 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated.

2.4 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.
   6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Do not run piping through electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces, if approved by local authority.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping to permit valve servicing.

H. Install piping to allow maximum possible headroom unless specific mounting heights or slopes are indicated.

I. Install piping at indicated slopes, or level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install piping to allow application of insulation.

M. Select system components with pressure rating equal to or greater than system operating pressure.

N. Install escutcheons for penetrations of walls, ceilings, and floors.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials conforming to the 25/50 flame spread and smoke developed rating.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

END OF SECTION 23 0510

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING (AIR & WATER)

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 testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
   1. Balancing AIRFLOW and WATER flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
   2. Adjusting total HVAC systems to provide indicated quantities.
   3. Verifying that automatic control devices are functioning properly.
   4. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.
B. AMCA: Air Movement and Control Association.
C. NEBB: National Environmental Balancing Bureau.
D. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Certified Testing, Adjusting, and Balancing Reports: Prepared on approved forms certified by the testing, adjusting, and balancing Agent.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC or NEBB or Engineer’s approved equal.
B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   2. Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.
C. Testing, Adjusting, and Balancing Reports: Use standard forms approved by the Engineer.
D. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
B. Provide 7 day’s advance notice for each test including scheduled test dates and times.
C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine approved submittal data of HVAC systems and equipment.
B. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

C. Examine system and equipment test reports.
D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
E. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
F. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
G. Examine strainers for clean screens and proper perforations.
H. Examine hydronic equipment for correct piping connections and for clean and straight fins.
I. Examine equipment for installation and for properly operating safety interlocks and controls.
J. Examine automatic temperature system components to verify the following:
    1. Dampers, valves, and other controlled devices operate by the intended controller.
    2. Verify dampers and valves are in the position indicated by the controller.
    3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
    4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
    5. Sensors are located to sense only intended conditions.
    6. Sequence of operation for control modes is according to the Contract Documents.
    7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
    8. Interlocked systems are operating.
K. Report to the Engineer deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to procedures contained in AABC national standards.
B. Perform testing and balancing procedures on each system according to procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
E. Also included under the balancing scope is the existing registers in the existing building indicated dark with revised CFMs, including but not limited to rebalancing the existing exhaust fan and registers serving Small Group A103A, Speech A103B, OT/PT A103C, and Vest A103D, see plans. Provide new pulleys and sheaves as necessary. See plans for all existing registers/grilles/diffusers indicated with dark text to be rebalanced to CFM's indicated.

3.3 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
    1. Supply, Return, and Exhaust Fans: Plus 10 to minus 10 percent.
    2. Air Outlets and Inlets: Plus 10 to minus 10 percent.
    3. Water Flow Rate: 0 to minus 10 percent.

3.4 REPORTS

A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems

found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

B. Final Report: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound in three-ring, loose-leaf binder, and tabulated and divided into sections by tested and balanced systems.
   1. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.
   2. Include a list of instruments used for procedures, along with proof of calibration.
   3. Final Report Contents: In addition to certified field report data, include the following:
      a. Pump curves.
      b. Fan curves.
      c. Manufacturers' test data.
      d. Field quality-control test reports prepared by system and equipment installers.
      e. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
   4. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
      a. Title page.
      b. Name and address of testing, adjusting, and balancing Agent.
      c. Project name.
      d. Project location.
      e. Architect's name and address.
      f. Engineer's name and address.
      g. Contractor's name and address.
      h. Report date.
      i. Signature of testing, adjusting, and balancing Agent who certifies the report.

3.5 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 0593

SECTION 23 0700
HVAC SYSTEMS INSULATION

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. The work in this section of the specification and the accompanying drawings consists of performing all labor, equipment, accessories, and materials and in performing all operations necessary for the installation of all insulation for the duct systems and sealing of sleeves.

B. Work to be insulated includes the following:
   1. All voids within roof curbs.
   2. All supply air, return air, transfer air, outside air, and exhaust air ducts.
   3. All circulating above ground hot water air separators, and other heating water equipment as required.
   4. All circulating above ground hot water heat piping, valves, and fittings.
   5. All cooling condensate piping insulation.
   6. All sleeves.

C. All insulation work shall be installed in a workmanlike manner by skilled workmen engaged in this type of work.

D. Fire-Test-Response Characteristics: Provide products with flame-spread and smoke-developed indices of 25 and 50, respectively, according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

1.3 SUBMITTALS

A. Shop drawings/product data as specified in Section 23 0500 shall include the following:
   1. Product Data: Identify thermal conductivity, thickness, and jackets (both factory installed and field applied, if any), for each type of product indicated.

1.4 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate size and location of supports, hangers, and insulation shields.
   1. All hangers and insulation shields for piping shall be large enough to encompass insulation without penetrating vapor barrier.
   2. It shall not be acceptable for insulation to envelope hangers/saddles.
   3. It shall not be acceptable for insulation to terminate on either side of hangers not properly sized to encompass insulation.

PART 2 - PRODUCTS

2.1 DUCTWORK INSULATION

A. RIGID BOARD DUCT INSULATION
   1. Rigid Board shall be fiberglass, CertainTeed type IB with FSK reinforced foil scrim-kraft jacket or accepted equal. Board density shall be 3 lb/cubic foot with thermal conductivity of .23 at 75 degrees F mean temperature. ASTM C 612, Class 1.

B. FLEXIBLE DUCT INSULATION
   1. Flexible insulation shall be fiberglass, CertainTeed standard duct wrap with FSK reinforced foil scrim-kraft jacket or accepted equal. Flexible insulation density shall be 1-1/2 lb/cubic foot with thermal conductivity of .24 at 75 degrees F mean temperature. ASTM C 553, Type I, Class B-4.

C. DUCTWORK INSULATION ACCESSORIES
   1. Provide staples, bands, wires, tape, anchors, comer angles and similar accessories as recommended by insulation manufacturer for applications indicated.

D. DUCTWORK INSULATION COMPOUNDS
   1. Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

E. INSULATION THICKNESS FOR DUCTWORK: All ducts are to be insulated unless otherwise noted. Insulation thickness and type shall be as follows:
   1. RTU/VAV System Supply Air:
      a. Rectangular Supply duct insulation before the VAV shall be exterior and 1-1/2" thick. In addition to wrapping, for the first 15' from units provide ½" interior liner for sound purposes
      b. Round Supply duct insulation before the VAV shall be exterior and 1-1/2" thick.
      c. Rectangular Supply duct insulation after the VAV shall be interior and ½" thick.
      d. Round Supply duct insulation after the VAV shall be exterior and 1-1/2" thick with the exception of exposed spiral ductwork in structure of Commons C101 to be uninsulated.
   2. Constant Volume System Supply Air:
      a. Rectangular Supply Air duct insulation shall be interior and ½" thick.
      b. Round Supply duct insulation shall be exterior and 1-1/2" thick with the exception of supply in structure of Ag Shop D103B to be uninsulated.
   3. Rectangular Return Duct Insulation shall be interior and ½" thick.
   4. Outside Air Duct Insulation shall be exterior and 2" thick.
   5. Transfer Duct Insulation shall be interior and ½" thick.
   6. Transfer Sleeves Insulation shall be interior and ½" thick.
   7. Exhaust Air Duct Insulation shall be exterior and 1-1/2" thick within 15' of power roof ventilator or louver termination unless otherwise noted.
      a. Exposed Spiral Exhaust Air duct from slotted welding hoods to be uninsulated spiral paint grip. All rectangular exhaust air duct serving welding hood runouts to be exterior insulated, 1-1/2" thick.
      b. Dryer exhaust ductwork to be exterior insulated 1-1/2" full length of duct.
   8. Grease Exhaust Air Duct shall be wrapped exterior in 3M Firebarrier Wrap or equal for full length of ductwork.
   9. Concealed ducts may be insulated with rigid or flexible fiberglass insulation.
   10. Exposed ducts shall be insulated with rigid fiberglass insulation only where exterior insulation is specified, including ducts exposed in shop spaces. See HVAC and architectural ceiling plans.
   11. Exposed ducts shall be insulated with rigid fiberglass insulation only.
      a. Protective Coating: Portions of insulated duct, 84 inches or less above the floor, shall be additionally protected by the application of a layer of 20 x 20 mesh Johns-Manville "Duramesh" coated with Benjamin Foster mastic #30-36.
      b. Rectangular Supply & Return Duct Insulation where run on existing roof from rooftop unit RTU-10 curb to the existing building wall penetration shall be exterior 2" thick & interior ½" thick.
         1) Exterior/Outdoor Ducts shall be insulated with Stucco Embossed Venture Clad 1577CW-E jacketing on all sides.
   12. All exposed ductwork in Commons C101, Stage C105, Existing Auxiliary Gymnasium, Ag Shop D103B, and FACS D104 to be paintgrip, see plans.

2.2 HEATING WATER AIR SEPARATORS & OTHER HEATING WATER EQUIPMENT INSULATION

A. All surfaces shall be insulated with 3 lb. density fiberglass board Johns-Manville #814-450 °F at a thickness of 3".

B. Insulation shall be cut or mitered where necessary to fit the contour of the equipment. All voids shall be packed with light density glass fiber insulation. Insulation sections shall be banded in place with ¾ 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 ½ inch of insulating cement such as OC-110 or equal in 2 layers over the wire mesh.

2.3 CIRCULATING ABOVE GROUND HEATING PIPING INSULATION

A. All piping in concealed and exposed areas shall be insulated with fiberglass pipe insulation with all service jacket. Jacket shall be factory-applied, and, where specified, with white foil scrim-kraft vapor barrier. Insulation shall be Johns-Manville Micro-Lok 850 HP, or accepted equal.

B. For pipe sizes to individual terminal units 1" and less – insulation thickness shall be ½". For pipe sizes of 1-1/4" thru 2" – insulation thickness shall be 1". For pipe sizes of 2-1/2" and larger – insulation thickness shall be 1-1/2".

C. Fittings, valves, flanges, etc. shall be insulated with fiberglass blanket, Johns-Manville Microlite or pre-cut mitered sections for elbows, J-M Micro-Lok (1lb/cu. ft. density).

D. Encase pipe fitting insulation with one piece pre-molded Zeston 2000 PVC fitting covers having flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.

E. Provide sheet metal insulation shields at all hanger locations.

F. Hangers for piping shall be large enough to encompass insulation. It shall not be acceptable for insulation to envelope hangers/saddles, or for insulation to stop on either side of hangers.

2.4 COOLING CONDENSATE DRAIN PIPING

A. All piping in concealed and exposed areas shall be insulated with flexible elastomeric thermal insulation consisting of closed-cell, sponge- or expanded rubber materials. Comply with ASTM C 534, Type I for tubular materials, Type II for sheet materials. Maximum thermal conductivity of 0.28 at 75 degrees.
   1. Provide adhesives as recommended by insulation material manufacturer.
   2. Provide ultraviolet-protective coating as recommended by insulation material manufacturer.

B. Insulation thickness shall be ½" and shall include a vapor retarder.

C. Fittings, valves, flanges, etc. shall be insulated with prefabricated thermal insulating fitting covers complying with ASTM C 450 for dimensions used in performing insulation to cover valves, elbows, tee, and flanges.

D. Install per manufacturer's recommendations.

PART 3 - EXECUTION

3.1 GENERAL APPLICATION

A. All insulation shall be applied on clean, dry surfaces. All joints shall be snugly butted against the adjoining piece and all joints, seams, voids, flat spots, etc., shall be filled with insulation cement. Do not use cut pieces or scraps abutting each other.

B. Where double layers are installed, the first layer shall be fastened with binding wire. All joints shall be staggered between the two layers.

C. Insulation on all cold surfaces must be applied in a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.

D. All surface finishes shall be extended to protect all surfaces, ends, and raw edges of insulation.

E. All insulation materials shall be installed in strict accordance with manufacturer's instructions, using recommended adhesives, mastics and coatings applied at specific coverage per gallon and temperature conditions.

F. Extend insulation without interruption through walls, floors and similar penetrations, except where otherwise indicated.

G. Maintain integrity of vapor-barrier jackets on insulation, and protect to prevent puncture or other damage.

H. Do not apply insulation to equipment, breechings, or stacks while hot.

I. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

J. Provide removable insulation sections to cover parts of equipment, which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

K. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

L. Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.2 DUCT APPLICATION

A. Rigid Insulation shall be secured to duct or sheet metal work by impaling over pin anchors space no more than 12” centers and secured with washers and clips. Pins shall be spot welded to the duct surface by a welding procedure which will not distort the sheet metal or burn through or mar interior finish of the duct plenums of casings but which develop full strength of the pin. Pin sizes and diameters shall be as recommended by manufacturer for type and thickness of insulation specified. Insulation on the underside of all horizontal or sloping ducts shall be additionally secured with 3M Insulation Adhesive 35.

B. Insulation shall be applied with all joints tightly butted and all points of impalement shall be pointed up and sealed with approved mastic before positioning clips. Where vapor barrier is specified, all joints, breaks, punctures and voids shall be filled with vapor barrier coating compound and covered with vapor seal material identical to the surrounding material.

C. All joints, duct attachments, and junctions (including those caused by ducts entering walls, projections such as hanger, etc.) shall be pointed and sealed with approved mastic and taped. Where no further finish is required over the vapor barrier, taping shall be carefully done to obtain a neat finished appearance.

D. Flexible Insulation shall be adhered to duct with fire-retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width over 30” shall be further secured on the underside with mechanical fasteners on 12” maximum centers. Insulation shall be butted with facing overlapping all joints at least 2” and sealed with fire-retardant vapor barrier adhesive. Seal all breaks and punctures with vapor barrier tape and same type of fire retardant adhesive.

3.3 MINERAL-FIBER PIPE INSULATION APPLICATION:

A. Fittings, valves, and flange insulation shall be wrapped firmly under compression (minimum 2:1) to a thickness equal to the adjoining insulation, secured with No. 20 gauge galvanized annealed steel wire, and finished with a smoothing coat of mastic, Johns-Manville No. 375 Insulating and Finishing Cement or equal.

B. Cold Fittings, Valves, Flanges, etc., shall be additionally sealed with a layer of resin coated glass mesh, such as Johns-Manville Duramesh 207 glass cloth, embedded between two 1/16” thick coats of vapor barrier coating, Benjamin Foster 30-35 or equal. Lap the sealed glass cloth at least 2” on itself and the adjoining insulation.

C. Premolded Insulation Valve and Fitting Covers shall be installed by tack fastening, banding, or taping as required by manufacturer.

D. Expansion Joints: For expansion joints, a tube of pipe insulation shall be fabricated that will allow the expansion joint to move within the tube. The insulating tube shall be fastened at one end of the pipe or equipment and the other end shall be free to slide over the adjacent insulated piping. Provide an aluminum jacket over the insulated pipe to provide a smooth surface on which the insulated tube may slide.

E. Insulation Under Hangers: Pipe hangers shall encompass the insulation and shall have sheet metal saddles furnished by the Mechanical Contractor.

F. Inserts shall be installed at all hanger locations. Inserts between the pipe and pipe hangers shall consist of 13lb/cubic foot hydrous calcium silicate pipe insulation, or wood blocking, of

thickness equal to the adjoining insulation and shall be provided with vapor barriers where required. Insulation inserts shall not be less than the following lengths:

1. ½" to 1-1/2" pipe size 10" long
2. 3" to 6" pipe size 12" long
3. 8" and larger pipe size 16" long

G. On all piping the full thickness of insulation and jacket shall run continuously under the sheet metal pipe saddle and through the pipe hanger (pipe hanger shall be large enough to permit full insulation thickness.)

3.4 FLEXIBLE ELASTOMERIC PIPE INSULATION APPLICATION:

A. Apply insulation to straight pipes and tubes as follows:
   1. Follow manufacturer's written instructions for applying insulation.
   2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to fittings and elbows as follows:
   1. Apply mitered sections of pipe insulation.

C. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Insulation Under Hangers: Pipe hangers shall encompass the insulation and shall have sheet metal saddles furnished by the Mechanical Contractor.

E. Inserts shall be installed at all hanger locations. Inserts between the pipe and pipe hangers shall consist of 13lb/cubic foot hydrous calcium silicate pipe insulation, or wood blocking, of thickness equal to the adjoining insulation and shall be provided with vapor barriers where required. Insulation inserts shall not be less than the following lengths:
   1. ½" to 1-1/2" pipe size 10" long
   2. 3" to 6" pipe size 12" long
   3. 8" and larger pipe size 16" long

F. On all piping the full thickness of insulation and jacket shall run continuously under the sheet metal pipe saddle and through the pipe hanger (pipe hanger shall be large enough to permit full insulation thickness.)

3.5 SEALING OF SLEEVES

A. All sleeves for pipes, ductwork, etc., furnished under Division 23 of specifications, penetrating floors, fire and/or smoke walls and full height partitions, including chase walls, shall be sealed in accordance with the following:
   1. All insulated services shall have the specified insulation terminated on either side of sleeve. Services which require a vapor barrier jacket shall have segment through sleeve insulated with calcium silicate having a minimum thickness same as specified for service. Vapor barrier jacket shall be uninterrupted. Entire void space between inside of sleeve and outside of duct, pipe, and/or calcium silicate insulation shall be packed with fiber insulation, conforming to HHI-521E Type 3 or HHI-558B Form A and having an ASTM fire class E-84 with fiber melt point in excess of 2000 degrees F., to a point 1/8 inch from ends of pipe sleeve. After void is packed with fiber insulation, services which are specified to be insulated shall have a section of insulation installed on each side of sleeve, insulation to be fitted tight to sleeve insulation. Balance of space in sleeve to be filled with nonhardening silicone conforming to TTS-00230 and of type which will allow 50 percent movement in one direction.
   2. Contractor is herein given the option to provide Pipe Shield, Inc., fire rated wall and floor sleeves for insulated and noninsulated piping in lieu of sealing sleeves as outlined above. Shields shall be installed in strict accordance with manufacturer's recommendations.

END OF SECTION 23 0700

SECTION 23 0900
CONTROLS & CONTROL SEQUENCES

(THIS TEMPERATURE CONTROL WORK WILL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR AND SHALL BE AN EXTENSION OF THE EXISTING DDC SYSTEM, & BE BY ALLIED CLIMATE PROFESSIONALS; CONTACT TRENT KAHRE AT 605-353-5022)

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 TEMPERATURE CONTROL WORK WILL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR.
   1. **See front end bid documents. Provide 2 line items for Temperature Control Work bid. One line item shall be for all DDC temperature control work for the addition and remodeled spaces only. The other line item shall be for all DDC temperature control work for the existing building that is not in the scope of the remodel.**

B. ALL TEMPERATURE CONTROLS INSTALLED BY THIS CONTRACTOR SHALL BE FIELD INSTALLED. If there are any discrepancies, contact the engineer's office at least 7 days prior to bidding.

C. Exact thermostats or space sensors &/OR PROTECTIVE COVERS to be located in the space shall be SUBMITTED TO & APPROVED BY SICHMELLER ENGINEERING & OWNER. Coordinate sensor only vs adjustable thermostats with digital display with Engineer prior to submitting shop drawings.

D. This Section includes controls & control sequences for HVAC systems, subsystems, and equipment.

E. The work in this section of the specification and the accompanying drawings consists of performing all labor and furnishing of all material and equipment necessary to install a complete Automatic Temperature Control System for the heating, ventilating, and air conditioning systems as indicated on drawings and specified herein, including minor items obviously necessary for complete and operating systems. Automatic Temperature Control System shall provide the "Sequence of Operation" as described in this section.

F. The control system shall consist of all room sensors, floor sensors, thermostats, valves, damper operators and other accessories to fulfill the intent of the specifications. The temperature control system shall be installed by trained mechanics regularly employed by the manufacturer of the temperature control system.

G. Each microprocessor based digital controller will be able to maintain its programmed memory in a non-volatile state during power failures without the use of batteries. All components and related temperature control components such as sensors, control valves, actuators, thermostats, control panels, etc. shall be manufactured by the same vendor.

1.3 QUALITY ASSURANCE

A. Agent Qualifications: An Independent Engineer Approved Temperature Control Contractor shall provide and install all temperature controls and control sequences as specified in this section.

1.4 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the trades and HVAC contractor to minimize conflicts with the Owner's operations.

1.5 BALANCING OF SYSTEMS

A. The Temperature Controls Contractor shall cooperate and work with the mechanical contractors to properly balance out all mechanical systems to obtain a satisfactory working system.

1.6 ADJUSTMENT AND CALIBRATION OF SYSTEMS

A. After the system is completely installed, the Temperature Controls Contractor with the presence of the mechanical engineer shall verify the various temperature control cycles as herein specified to the satisfaction of the engineer. The Temperature Controls Contractor shall submit direct to the engineer, a tabulation of all outdoor air, mixed air, discharge air, and all room temperatures for each unit. All thermostats and their thermometers shall be calibrated after installation.

1.7 SUBMITTALS

A. Shop drawings as specified in Section 230500 shall include the following:
   1. All control devices, valves, dampers and auxiliary devices to be used.
   2. Written descriptions and diagrams to describe the operational sequences.
   3. Room thermostat schedule.
   4. Variable Frequency Drives as follows:
      a. Refer to HVAC Motor Schedule and Mechanical Schedules on Plans for VFD's provided by TC. If there are any discrepancies or questions, contact the engineer's office prior to bidding.

1.8 CONTROLLERS & WEB-ACCESSED SYSTEM WITH CUSTOM COLOR GRAPHICS

A. Provide BACnet Controllers that are BACnet Testing Laboratory Listed. Network communication protocol used throughout entire DDC system shall be native BACnet Communication certified by the BTL open to Owner and available to other companies for use in making future modifications to DDC system.

B. Unless otherwise specified, all equipment described below shall be controlled and monitored via a Web-accessed system. The Web-accessed system shall allow for any owner's designated personnel to change schedules and setpoints through a PC user on the Local Area Network or remotely via the Internet. This system shall provide complete custom color graphics and password protection. This system shall allow for remote monitoring, control, and troubleshooting via the Internet.

C. Custom Graphics of Floor Plan: Display the following data:
   1. Equipment Designation/Label.
   2. Outside-Air Temperature Indication.
   3. Cooling or Heating/Economizer System Mode Indication.
   4. Zone temperature indication and setpoints.
   5. Alarms (as recommended by T.C.C.).

PART 2 - CONTROL SEQUENCES

2.1 PACKAGED ROOFTOP UNITS WITH STAGED DX COOLING, HOT GAS BYPASS (RTU-9,10 ONLY), MODULATING (RTU-7,8, EXG RTU-1 ONLY) OR STAGED (RTU-9,10, EXG RTU-2,3,4,5) NATURAL GAS HEAT, AND POWERED EXHAUST – SINGLE ZONE APPLICATION (RTU-7,9, EXG RTU-2,3,4,5,6 ONLY), OR VAV APPLICATION (RTU-8,10, EXG RTU-1 ONLY)

A. Occupied and Unoccupied cycles of operation shall be determined by the DDC controller serving this unit. During occupied operation, the RTU supply fan will run continuously with the outside air damper & powered exhaust fan on to its minimum open position (adjustable). A discharge air temperature sensor will maintain the discharge air temperature/humidity at its setting (reset based on building demand determined by space heating/cooling/humidity) by modulating the outdoor air dampers and powered exhaust fan in sequence with the modulating or staged gas heat, DX cooling (with hot gas bypass on RTU-9&10 only). Upon a call for cooling the outside air dampers and exhaust fan will be modulated open beyond their minimum setting and the return air dampers will be modulated closed. A mixed air low limit sensor will prevent the mixed air temperature from dropping below 55F (adj.). An outdoor air sensor will

over-ride the outdoor air damper back to minimum position whenever the outdoor air temperature is above 60F (adj.). The gas heat, DX cooling (HGBP where applies) will be modulated or staged as necessary to maintain the discharge air temperature/humidity at its setting. A manual reset, safety low limit freeze protection thermostat on the leaving side of the heating coil will stop the fans and close the outdoor air dampers if a freeze condition is sensed.

B. VAV RTU Systems Only (RTU-8,10, EXG RTU-1 Only): A static pressure sensor in the supply air duct 2/3 way to furthest reheat box will maintain its set point (1.0" wc., adj.) by modulating the speed of the Variable speed drive on the supply air fan. A duct static pressure high limit will stop the unit fan if its setting is exceeded (3" wc, adj.).

C. Minimum Outside Air Ventilation - Carbon Dioxide (CO2) Control: When in the occupied mode, the controller shall measure the zone CO2 levels and override normal damper operation to maintain a CO2 setpoint of 800 ppm (adj.). When zone CO2 levels are at 800 ppm or below, the outside air damper shall be closed. The outside air damper shall modulate open on rising CO2 concentrations to the scheduled minimum outside air level for 1000 ppm (adj.) or above. CO2 sensors mounted in return air duct unless otherwise noted on motor schedule.

D. During Unoccupied operation the RTU supply fan & exhaust fan will be off and the outdoor air dampers will be closed. If any space temperature in zones served by this unit fall below 60F during the unoccupied cycle, the rooftop unit will be started with the outdoor air dampers closed and exhaust fan disabled and the modulating gas heat will be controlled to supply 90F (adj.) air to the spaces until the heating is satisfied. This same cycle will take place during cold weather on morning warm up except that the unit will operate in the heating mode with the outside air dampers closed until the return air temperature reaches 68F (adj.). During unoccupied operation the DX cooling will be inoperative.

E. A smoke detector (provided & installed by E.C.), located in the return & supply air, signals alarm, stops fans, and closes smoke dampers when products of combustion are detected in airstream.

F. Operator's Workstation shall display the following:
   1. Equipment Designation.
   2. Room/Area Served.
   3. Room/Area Temperature.
   4. Room/Area Temperature Setpoint, Occupied.
   5. Room/Area Temperature Setpoint, Unoccupied.
   6. Room/Area CO2 Indication. (RTU-7,9 only)
   7. Room/Area CO2 Setpoint. (RTU-7,9 only)
   8. Return Air CO2 Indication (RTU-8,10 only)
   9. Return Air CO2 Indication (RTU-8,10 only)
   10. Room/Area Humidity Indication. (RTU-7,9 only)
   11. Room/Area Humidity Setpoint. (RTU-7,9 only)
   12. Return Air Humidity Indication (RTU-8,10 only)
   13. Return Air Humidity Setpoint (RTU-8,10 only)
   14. System On-Off Indication.
   15. System Occupied/Unoccupied Mode.
   16. System Fans On-Off Command.
   17. Supply Fans On-Off Command.
   18. Supply Fans On-Off Indication.
   19. Supply Fans Speed %.
   20. Exhaust Fan On-Off Command.
   21. Exhaust Fan On-Off Indication.
   22. Exhaust Fan Speed %.
   23. Building Pressure Sensor.
   24. Building Pressure Setpoint.
   25. Outside Air Damper Position.
   26. Outside Air Temperature Indication.
   27. Return Air Temperature Indication.

28. Mixed Air Temperature Indication.
29. Mixed Air Temperature Set-Point.
30. Mixed Air Damper Position.
31. Supply Fan Discharge Air-Temperature Indication.
32. Supply Fan Discharge Air-Temperature Set-Point.
33. Gas Heat Modulation % (RTU-7,8, EXG RTU-1 Only)
34. Gas Heat Stage (RTU-9,10, EXG RTU-2,3,4,5,6 only)
35. Gas Heat On-Off Command.
36. Hot gas bypass status (if available)
37. Each Compressor/Cooling Stage On-Off Indication.
38. Each Compressor/Cooling Stage Run-Time Hours.
39. Alarm Status (Alarms as Recommended by T.C.).

2.2 SHUTOFF VARIABLE AIR VOLUME (VAV's) TERMINAL UNIT CONTROL (NEW AND EXISTING UNITS)

A. VAV UNITS WITH HYDRONIC CONTROLS
   1. The VAVs will be controlled by the space temperature sensor to vary the primary air flow to the space to provide cooling or heating whenever the air handling unit is operational. On a call for cooling in the space, the primary damper will be modulated open beyond the minimum position to meet the cooling demand. On a call for heating in the space the primary air damper will be modulated to the heating position (adj.) as scheduled and the HW 2-way modulating normally open control valve will modulate open as necessary (0-100%) to provide heat to the space. 2-way valve normal (fail) to open position.
   2. All VAV Units shall operate in either the occupied or unoccupied mode and the space sensor with adjustable setpoint shall have an over-ride button on the face to return the terminal unit to its occupied mode of operation if the terminal unit is in "Unoccupied" mode.

B. Operator's Workstation shall display the following:
   1. Equipment Designation/Label.
   2. Room/area served.
   3. Room occupied/unoccupied.
   4. Room temperature.
   5. Room temperature set point, occupied.
   6. Room temperature set point, unoccupied.
   7. Actual Air Temperature Delivered to the VAV.
   8. Mode indication, heating/cooling/satisfied.
   9. Entering Hot Water Temperature
   10. 2-way Modulating hot water valve position as percent open.
   11. Air-damper position as percent open
   12. Supply airflow rate, target.
   13. Supply airflow rate, actual.
   14. VAV Discharge Air Temperature.
   15. Alarm Status (Alarms as recommended by T.C.C.).

2.3 FAN COIL UNIT WITH HOT WATER REHEAT, DX COOLING (FC-A103 ONLY) & AIR-COOLED CONDENSING UNIT (FC-A103) CONTROL

A. Occupied Operation:
   1. While the space is occupied, the fan coil fan operates continuously supplying a constant volume of supply air.
   2. While there is no call for heating or cooling from any space thermostats, the fan coil fan shall run continuously with the outside air damper open to provide minimum ventilation air CFM to spaces. The DX cooling coil shall be enabled and hot water reheat coil shall be modulated as necessary to discharge room neutral temperature air.
   3. Minimum Outside Air Ventilation - Carbon Dioxide (CO2) Control: When in the occupied mode, the controller shall measure the zone CO2 levels in the return air duct and override normal damper operation to maintain a CO2 setpoint of 800 ppm (adj.). When

zone CO2 levels are at 800 ppm or below, the outside air damper shall be closed. When CO2 levels are between 800 ppm and 1000 ppm, the outside air damper shall linearly modulate open, from closed at 800 ppm to scheduled minimum value at 1000 ppm. When CO2 levels are above 1000ppm, the outside air damper shall be set at the scheduled minimum value. CO2 sensor to be mounted in the return air duct.

4. Cooling Mode:
   a. When outside air is less than or equal to 55 F (economizer):
      1) On an increase in space temperature, modulate the outside air damper open past the ventilation minimum to increase the flow of cool outside air from the louver to the fan coil mixing box. Modulate the return air damper/outside air damper proportionally to satisfy room cooling requirements.
      2) On a decrease in space temperature, modulate the outside air damper closed to decrease the flow of cool outside air from the louver to the fan coil mixing box back to the ventilation minimum CFM. The 2-way modulating control valve on the reheat coil shall be proportionally modulated to maintain room neutral temperature discharge.
   b. When outside air is greater than 55 F:
      1) On an increase in space temperature, enable DX cooling on condensing unit.
      2) On a decrease in space temperature past setpoint, disable DX cooling on condensing unit. The 2-way modulating control valve on the reheat coil shall be proportionally modulated to maintain room neutral temperature discharge if necessary.
5. Heating Mode:
   a. On a decrease in space temperature, the 2-way modulating control valve on the reheat coil shall be modulated to increase the discharge air temperature proportionally to the room demand.
   b. On an increase in space temperature, modulate close the 2-way modulating control valve on the reheat coil as necessary.

B. Unoccupied mode:
1. While the space is unoccupied, the fan coil fan is disabled and the outside air damper is closed. The fan is only enabled to supply a constant volume of supply air when there is a call for heating. During unoccupied operation, the outside air damper shall remain fully closed.
2. Heating Mode:
   a. On a decrease in space temperature below unoccupied setpoint (60F, adj), the fan is enabled, and the 2-way modulating control valve on the reheat coil is modulated to increase the discharge air temperature to 90F, adj. This same cycle will take place during cold weather on morning warm up except that the unit will operate in the heating mode with the outside air dampers closed until the return air temperature reaches 68F (adj.).
3. Cooling Mode:
   a. Cooling is disabled during unoccupied operation.

C. Operator Workstation: Display the following data:
1. Room/area served.
2. Room occupied/unoccupied.
3. Room temperature.
4. Room temperature set point, occupied.
5. Room temperature set point, unoccupied.
6. Heating Occupied/Unoccupied Setpoints
7. Cooling Occupied/Unoccupied Setpoints (FC-A103 only)
8. Mode indication, heating/cooling/satisfied.
9. Return Air Damper Position (% open).
10. Outside Air Damper Position (% open).

11. Return Air CO2 indication.
12. Return Air CO2 setpoint.
13. Return Air relative humidity indication.
14. Return Air temperature.
15. Outside Air temperature.
16. Mixed Air temperature.
17. Mixed Air Temperature Set-Point
18. Mixed Air Damper Position.
19. Economizer Mixed Air Temperature Setpoint.
20. Economizer Status.
21. Heating Coil Water valve position (% open).
22. Heating Coil Leaving Air Temperature.
23. Heating Coil Leaving Air Temperature Setpoint.
24. Fan Coil Discharge Air Temperature.
25. Fan Coil Discharge Air Temperature Setpoint.
26. Fan Coil Fan Run Time (hours)
27. Condensing Unit DX Cooling Enabled/Disabled. (FC-A103 only)
28. Condensing Unit Run Time (hours) (FC-A103 only)
29. Alarm Status (alarms as recommended by T.C.C.).

2.4 NEAR CONDENSING HOT WATER BOILERS & BOILER CIRCULATORS (NEW B-1/CP-1, NEW B-2/CP-2)

A. BAS system shall integrate with the boiler control systems as required.

B. BAS contractor shall provide the necessary programming to lead/lag and alternate the primary boiler.

C. Reset schedule - control heating water loop supply temperature in straight-line relationship for the following outside air temperature conditions:
   1. 180 deg f (adj.) heating water when outside temperature is less than 20 deg f.
   2. 140 deg f (adj.) heating water when outside temperature is greater than 50 deg f.
   3. 115 deg f (adj.) heating water when outside temperature is greater than 65 deg f.
   4. Do not allow the return (entering) water temp to be lower than minimum recommended by Boiler Manufacturer (130F adj verify with exact boiler installed).
      a. In order to prevent low inlet water temperature, TC to provide & PC to install a modulating three-way mixing valve on boiler manifold inlet prior to closely spaced tees. If the boiler inlet water temperature is below 130° F (adjustable) or when boiler HWS/HWR differential temperature is above 40° F (adjustable), the valve shall modulate closed causing boiler outlet water to blend with the inlet water. When the inlet water temperature and differential temperature return to an acceptable range, the boiler outlet valve shall modulate open to maintain setpoints.

D. An emergency boiler shut-down push button (provided & installed by E.C.), stops boilers when emergency pushbutton is pressed.

E. Boiler circulator enabled by boiler relay, combination starter/disconnect by EC.

F. Boiler circulators shall have a current switch to prove pump operation.

G. Graphic Operator's Workstation shall display the following (each water temp point represents a temperature sensor well to be installed in the heating system piping, coordinate with PC to install wells within 12" of thermometer wells by PC):
   1. Outside-Air Temperature Indication.
   2. Each Boiler enable/disable.
   3. Each Boiler burner modulation.
   4. Each Boiler Circulator Status.
   5. Each Boiler return water temperature.
   6. MFR's Minimum return water temperature.
   7. Each Boiler supply water temperature.
   8. Each Boiler Runtime.

9. Alarm Status (alarms as recommended by T.C.C.).

2.5 EXISTING GAS-FIRED BOILER SYSTEM (EXG B-1 & EXG CP-1)

A. EXISTING GAS-FIRED BOILER & COMBUSTION AIR DAMPER

B. This gas-fired boiler shall be enabled and disabled as necessary, supply water temperature reset based on OAT, log operating hours for boiler, etc.

C. The BAS system shall enable or disable as required to maintain the hot water supply temp. The BAS will send a heating system enable and disable signal and shall send an alarm signal if the hot water supply temperature falls 10F (adj.) below the setpoint.

D. Graphic Operator's Workstation shall display the following:
1. Outside-Air Temperature Indication.
2. Boiler/CP-1 off-heating indication.
3. Gas Fired Boiler Burner Indication.
4. Combustion Air Damper Open-Closed Command.
5. Combustion Air Damper Open-Closed Indication.
6. Return Water Temp Back from System
7. Supply Water Temp Out to System
8. Manufacturer's Minimum Return Water Temp Back into Boiler (140F, P.C. to confirm with boiler rep)
9. Return Water Temp Back into Boiler Actual
10. Heating Hot Water Supply Temperature Out of Boiler Actual.
11. Alarm Status.

2.6 HEATING WATER LOOP PUMPS (NEW CP-3 & CP-4, EXISTING CP-2 & CP-3) CONTROL:

A. The lead hot water heating pump shall be started by the BAS whenever there is a call for heating. 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.

B. 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 BAS 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.

C. Graphic Operator's Workstation shall display the following (each water temp point represents a temperature sensor well to be installed in the heating system piping, coordinate with PC to install wells within 12" of thermometer wells by PC):
1. Equipment Designation.
2. Auto or Manual Override indication.
3. Differential Pressure Set-point.
4. Differential Pressure Actual.
5. Primary pump on-off indication.
6. Primary pump speed indication.
7. Back-up pump on-off indication.
8. Back-up pump speed indication.
9. Heating Water Supply to Building Temperature after boiler closely spaced tees.
10. Heating Water Supply to Building Temperature after P-3&4.
11. Heating Water Return from Building Temperature prior to boiler closely spaced tees.
12. Outside-Air Temperature Indication.
13. Alarm Status (alarms as recommended by T.C.C.).

2.7 DUCTLESS SPLIT SYSTEM TEMPERATURE CONTROL

A. VC to provide and install hardwired remote t-stat (no DDC work)

2.8 CABINET UNIT HEATER CONTROL (NEW AND EXISTING)

A. Cabinet unit heaters to have 2-way or 3-way modulating temperature control valve (see plans for control valve type) with normal/fail position to flow through coil. Normal/fail to last position shall not be acceptable.

B. The unit heaters will be controlled by the space temperature sensor. On a call for heat, the first stage of heat shall be water flow through the coil at 100% flow with the fan disabled. If the room temperature drops more than 1 degree below setpoint after first stage heating, the fan will be enabled and hot water valve will modulate as necessary to meet the heating demand. The BAS will prevent the fan from operating unless 100 degree F. (adj.) hot water is available. The modulating control valve shall have normal (fail) position as flowing through heating coil, fail to last position shall not be acceptable

C. OPERATOR WORKSTATION
   1. Display the following data:
      a. Equipment Designation.
      b. Room/area served.
      c. Room occupied/unoccupied.
      d. Room temperature.
      e. Room temperature set point.
      f. Modulating hot water valve position as percent open to coil.
      g. Discharge Air Temperature.
      h. Alarm Status (alarms as recommended by T.C.C.).

2.9 FINNED TUBE RADIATION (NEW AND EXISTING) & RADIANT CEILING PANEL CONTROL

A. The radiation will be controlled by the space temperature sensor. On a call for heat, the 2-way 2-position normally open hot water valve will open as necessary to meet the heating demand. 2-way valve normal (fail) position to flow through coil, fail to last position shall not be acceptable. The space served by the radiation is controlled in occupied and unoccupied modes as follows:
   1. OCCUPIED MODE
      a. The controller monitors the room temperature sensor and modulates the 2-way heating valve open to maintain the space temperature at occupied set point.
   2. UNOCCUPIED
      a. The controller monitors the room temperature sensor and modulates the 2-way heating valve open to maintain the space temperature at unoccupied set point.
   3. Operator Workstation: Display the following data:
      a. Equipment Designation
      b. Room/area served.
      c. Room occupied/unoccupied.
      d. Room temperature.
      e. Room temperature set point, occupied.
      f. Room temperature set point, unoccupied.
      g. 2-way 2-position hot water valve position.
      h. Alarm Status (alarms as recommended by T.C.C.).

2.10 EXHAUST FAN CONTROL (EF-X)

A. EF-6 – Storage C104, Gym Storage C108, Boys C109, Ref C110, Girls C111 Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

B. EF-7 – Grease Hood Exhaust – shall operate from the integral switch on the hood
   1. D.D.C. controls shall monitor fan operation & prevent fan operation during Unoccupied Operation (as determined by the BAS).

C. EF-8 – Dishwasher Hood Exhaust – shall operate by a lighted pilot switch installed by E.C.
   1. D.D.C. controls shall monitor fan operation & prevent fan operation during Unoccupied Operation (as determined by the BAS).

D. EF-9 – Restroom D101A Exhaust – shall operate with lights by EC, no BAS interface.

E. EF- 10 – Girls RR D102A, Cust. D102C, boys RR D102B, Area D Chase Enclosure Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).
      a. During unoccupied operation, enable exhaust fan if temperature in Area D Chase Enclosure drops below 60 degrees or if relative humidity in Area D Chase Enclosure rises above 60% RH

F. EF- 11 – FACS D104 & EF-A's Rangehood Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).
   2. T.C. to provide & install duct probe sensors near the terminations of the room exhaust registers to control & monitor exhaust duct pressure. The sensors shall be accessible via a 12"x12" access door provided & installed by V.C. When no rangehood exhaust fans are running, EF-11 shall run at a minimum speed to maintain a negative pressure of 0.1" W.C. (adj) in the main exhaust duct during occupied operation. As rangehood exhaust fans are enabled and discharge into the main exhaust duct, T.C. to modulate the speed of EF-11 to maintain a negative pressure of 0.1" W.C. (adj) in the main exhaust duct.
   3. T.C. to provide and install a mechanical timer switch near the space's light switch to override temperature controls and run fan at max speed. Label timer switch with placard.

G. EF- 12 – Workroom D105 Exhaust – shall operate with timer switch by EC, no BAS interface.

H. EF- 13 – Science Prep D106A Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

I. EF- 14 – Science D106 Exhaust – shall operate by a lighted pilot switch installed by E.C.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

J. EF-15 – Science D106 Fume Hood Exhaust – shall operate by integral switch on fume hood, wired by E.C.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

K. EF- 16 – Ag Shop D103B Exhaust – shall operate with lighted pilot switch by TC
   1. Fan shall also operate with NO2CO gas detector system provided & installed by TC.
   2. Occupied & unoccupied operation shall be the same.

L. EF- 17 – Workroom A101 Exhaust – shall operate with timer switch by EC, no BAS interface.

M. EF- 18 – Boys A102 & Girls A103 Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

N. EF- 19 – Ag Shop D103B Welding Station Hoods HD-A's Exhaust – shall operate by a lighted pilot switch installed by T.C.
   1. Occupied & unoccupied operation shall be the same.

O. EF- 20 – Area A Building Relief – Shall be modulated (based on building pressure) to maintain a slight positive pressure in the classroom wings relative to outdoors (0.05" w.c., adj.).
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

P. EF- 21 – Area B&C Chase Enclosure Exhaust – shall operate continuously during occupied & unoccupied operation.
   1. BAS to monitor each chase enclosure temperature and relative humidity.

Q. EXG EF – Remodeled Area A: Small Group A103A, Speed A103B, OT/PT A103C, Vest. A103D Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

R. EXG EF-1 – EXG Mechanical/Custodian Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

S. EXG EF-2 – EXG Work Room Exhaust – shall operate with existing lighted pilot switch.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

T. EXG EF-3 – EXG Conference/Unisex/Men/Women Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

U. EXG EF-4 – EXG Concessions Exhaust – shall operate with existing lighted pilot switch.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

V. EXG EF-5 – EXG Locker Rooms/Men/Women Exhaust – shall operate during occupied hours as determined by the BAS System.
   1. D.D.C. controls shall prevent fan operation during Unoccupied Operation (as determined by the BAS).

2.11 DOMESTIC HOT WATER DIGITAL WATER TEMPERING SYSTEM

A. No BAS control on new and existing domestic hot water recirc pumps. Note – digital mixing valve requires minimum 5 GPM flow during use, coordinate occupied setpoints with PC to ensure PC's time clock is enabled during occupied hours to meet minimum flow requirements of the mixing valve.

B. The BAS shall integrate with the domestic hot water digital water tempering system. The BAS shall modulate the digital water tempering system mixing valve to maintain a leaving hot water temperature of 120F (sensor shall be integral to digital water tempering system), with water heater set to 140F (no DDC control of gas water heaters).

C. Operator's workstation to display the following:
   1. Mixed outlet water temperature in degrees F
   2. Mixed outlet water temperature setpoint in degrees F.
   3. Actuator override.
   4. High/low temperature alarm.
   5. Domestic Hot Water Return water temperature.
   6. Domestic Hot Water Return water temperature setpoint (115F, adj).

2.12 EXISTING ELECTRIC HEAT CONTROL

A. On a call for heat by the space served by electric heat, the BAS shall enable associated electric heaters as necessary to meet the heating demand. See HVAC plans for t-stat locations controlling electric heat, see electrical plans for electric heat being controlled by TC. Control relay & j-box by TC.
   1. Operator Workstation: Display the following data:
      a. Equipment Designation/Label.
      b. Space Setpoint.
      c. Space Actual.
      d. Electric Heat Status.
      e. Alarm Status (alarms as recommended by T.C.C.).

2.13 EXISTING UNIT VENTILATORS IN AREA-A ELEMENTARY WING CONTROL

A. Existing DDC temperature controls of existing unit vents to remain as is, but incorporate the new building relief air fan EF-20 into the outside air sequences.

2.14 EXISTING GYMNASIUM & EXISTING STAGE POWER ROOF VENTILATORS IN AREA-C/E CONTROL

A. Existing manual motor starter control of existing PRVs to remain as is.
   1. Interface BAS with existing exhaust fans to monitor status and log runtime. Alarms as recommended by TC.

2.15 TRAINING

A. The Temperature Control Contractor shall provide (8) hours of training to the owner's representative.

2.16 WARRANTY

A. The entire control system shall be warranted for a period of 1 year from the date of beneficial use of the system.

PART 3 - PRODUCTS

3.1 NO2CO DETECTOR

A. Furnish and install combination nitrogen dioxide (NO2) detector/carbon monoxide (CO) detector as noted on plans. Provide start-up and training and confirm proper operation.

3.2 VARIABLE FREQUENCY DRIVES

A. WARRANTY
   1. Warranty shall be 24 months from the date of start-up, not to exceed 30 months from the date of shipment.
   2. Warranty shall include all parts.

B. GENERAL
   1. VFD shall be current rated at 8 kHz carrier frequency for VFD's 1-75 HP and 4 kHz for VFD's 100-400 HP. All HP ratings shall meet or exceed Table 430-150 of the National Electric Code. Three Phase Motor Full Load Currents, HP, Maximum Current, and Rated Voltage shall appear on the drive nameplate.
   2. VFD shall not generate damaging voltage pulses at the motor terminals when applied within 500 feet of each other. Both Drive and Motor shall comply with NEMA MG1 section 30.40.4.2 which specifies these limits at a maximum peak voltage of 1600 Volts and a minimum rise time of .1 microseconds.

C. CODES/STANDARDS
   1. VFD and options shall be c UL-508 listed.
   2. NEMA 12 enclosed VFD shall be UL-1995 approved for mounting in conditioned air ducts and plenums.
   3. The drive and options shall comply with the applicable requirement of the latest standards of ANSI, NEMA, National Electric Code NEC, NEPU-70, IEEE 519-1992, FCC Part 15 Subpart J, CE 96.

D. QUALITY ASSURANCE
   1. Every VFD shall be functionally tested under motor load. During this load test the VFD shall be monitored for correct phase current, Phase voltages, and motor speed. Correct Current Limit operation shall be verified by simulating a motor overload.
   2. Verification of proper factory presets by scrolling through all parameters shall be performed to ensure proper microprocessor settings. The computer port should also verify that the proper factory settings are loaded correctly in the drive.
   3. All options shall be functionally tested. Proper heater coil installation in motor overload, if supplied, shall be verified.

E. SERVICE
   1. Factory authorized representative start-up shall be included for each VFD provided.

2. Service engineers shall be employed by the manufacturer or be certified by the manufacturer and provide start-up service including physical inspection of drive and connected wiring and final adjustments to meet specified performance requirements.

F. DRIVE FUNCTIONS
1. An electronic overload circuit designed to protect an AC motor operated by the VFD output from extended overload operation on an inverse time basis. This Electronic overload shall be UL® and NEC recognized as adequate motor protection. No additional hardware such as motor overload relays or motor thermostats shall be required.
2. An LED display mounted on the door of the cabinet that digitally indicates:
   a. Frequency output
   b. Voltage output
   c. Current output
   d. Motor RPM
   e. Input kW
   f. Elapsed Time
   g. Time Stamped Fault Indication
   h. DC Bus Volts
3. The VFD shall have the capability of riding though power dips up to 10 seconds without a controller trip depending on load and operating condition. In this extended ride through, the drive shall use the energy generated by the rotating fan as a power source for all electronic circuits.
4. RS232 Port and Windows based software for Configuration, Control, and Monitoring.
5. An isolated 0-20mA, 4-20mA or 0-4, 0-8, 0-10 volt analog speed input follower.
6. An isolated 0-10 V or 4-20 mA output signal proportional to speed or load.

G. PROTECTIVE CIRCUITS AND FEATURES
1. Motor current exceeds 200% of drive continuous current rating.
2. Output phase-to-phase short circuit condition.
3. Total ground fault under any operating condition.
4. High input line voltage.
5. Low input line voltage.
6. Loss of input or output phase.
7. External fault. (This protective circuit shall permit wiring of remote N.C. safety contact to shut down the drive). User supplied end switches, thermal switches, fire-stats, freeze-stats inputs will be connected to this VFD supplied circuit.
8. Metal oxide varistors for surge suppression shall be provided at the VFD input terminals.

H. GENERAL OPTIONS AND MODIFICATIONS
1. Input line fuses shall provide protection for the input rectification circuit using Class J fuses with interrupting rating of 200,000 AIC. The series interrupting rating of the VFD and fuses shall be a minimum of 30,000 AIC and shall be stated in the VFD Instruction Manual as required by UL
2. A main input disconnect shall mount within the standard NEMA 1 or NEMA 12 enclosure for positive power disconnect of the VFD. It shall have the capability for door padlocking.
3. A three phase 3% impedance Input Line Reactor shall be provided to minimize drive harmonics on the AC line and protect the drive from damaging electrical system transients.

I. INSTALLATION
1. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the AFD's in accordance to the manufacturer's recommendation as outlined in the instruction manual.
2. The electrical contractor shall complete power wiring. The contractor shall install the AFD's in accordance to the manufacturer's recommendation as outlined in the instruction manual.

J. TRAINING
1. The contractor shall provide a training session for owner's representatives

2. The training shall be conducted by the manufacturer's authorized representative and shall include:
3. Instructions on the proper operation of the equipment
4. Instructions on the proper maintenance of the equipment

PART 4 - EXECUTION

4.1 INSTALLATION

A. All devices in mechanical rooms shall be panel mounted whenever possible. Wiring to remote mounted devices in mechanical rooms and inaccessible spaces shall be run in conduit. Wiring in accessible ceilings may be run with plenum rated cable providing it is securely fastened to the structural members at 4' intervals. In general, all wiring in conjunction with the automatic temperature control system shall be furnished by the Temperature Control Contractor under this section of the specifications in accordance with Division 26 of the specifications.

B. All automatic valves shall be furnished by the Temperature Control Contractor and installed under his supervision by the Heating Contractor. All automatic dampers, not furnished with the equipment, shall be furnished by the Temperature Control Contractor and installed under his supervision by the Sheet Metal Contractor.

C. **Room thermostats and remote sensors shall be wall mounted type and shall be mounted to match installation height of adjacent switches/sensors by EC. Coordinate mounting location with EC to locate t-stats/sensors and wall switches. Thermostats and sensors shall not be mounted on outside walls.**

4.2 PROJECT COMPLETION AND ACCEPTANCE

A. Upon completion of this project, it will be this Contractors responsibility to insure that the control system is functioning properly. The Contractor shall also insure that the control diagrams for the project are brought up to date and that they reflect the control system "as built". These control diagrams and screen shots of the various screens of the color graphics system shall be included in the Operation and Maintenance Manuals, which shall be turned over to the Owner following the acceptance of the above procedure by the A/E.

4.3 ON-SITE ASSISTANCE

A. **ON-SITE Adjustments: Within one year of date of Substantial Completion, provide 4 hours EVERY MONTH to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions and improve efficiency. Certain off-site adjustments may be acceptable if owner and engineer approved.**

END OF SECTION 23 0900

SECTION 23 2113
HYDRONIC PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work in this specification and the accompanying drawings consists of performing all labor and furnishing of all material and equipment necessary to install complete systems listed below, including minor items obviously necessary for complete and operating systems. Piping materials and equipment specified in this Section include the following:
   1. All new hot water hydronic piping systems
   2. Gravity Condensate Drain Piping
   3. Pipes, fittings, and specialties.
   4. Special-duty valves.
   5. Meters and gages.
   6. Hydronic specialties.

B. See Division 23 Section "Basic HVAC Materials and Methods" for general piping installation requirements.

C. Also included is the work involved to remove existing associated equipment, remodeling of existing systems, including connections between new and existing systems.

D. Hydronics contractor to be responsible for all condensate drainage piping.

1.3 SUBMITTALS

A. Shop Drawings: Shop drawings as specified in Section 230500 shall include the following:
   1. Hydronic Specialties
   2. Natural Gas Near-Condensing Boiler-Burner Units
   3. Boiler Combustion Air Materials
   4. In Line Circulator Pumps for Boilers
   5. Base Mounted End Suction Pumps Heating Loop
   6. Bypass Filter Feeder & Spare Filters
   7. Heating Water Hydronic Pipe, Valves, and Fittings
   8. Heating Water Expansion Tank and Air Separator
   9. Gravity Condensate Drain Piping
   10. Flow Control and Strainer Valves
   11. Hot Water Cabinet Unit Heaters
   12. Hot Water Finned Tube Radiation
   13. Hot Water Radiant Ceiling Panels
   14. Propylene Glycol – 30% Solution Heating System
   15. Glycol Solution Analysis & Water-Treatment Program: Independent analysis of proposed and existing heating water solutions before and after work is complete to confirm proper glycol % and treatment. If solution analysis is not satisfactory, make adjustments as recommended by glycol supplier.
   16. Spare Parts

B. Product Data: For each type of special-duty valve indicated. Include flow and pressure drop curves based on manufacturer's testing for diverting fittings, calibrated balancing valves, and automatic flow-control valves.

C. Shop Drawings: Detail fabrication of pipe anchors, hangers, special pipe support assemblies, alignment guides, expansion joints and loops, and their attachment to the building structure.

D. Detail location of anchors, alignment guides, and expansion joints and loops.

E. Field quality-control test reports.
F. Operation and maintenance data.

1.4 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work shall be as specified in Section 23 0510.

1.5 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
B. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
C. Uponor PEX-a tube and fitting systems must be installed by a trained installer. Installer must be able to provide verification from the manufacturer that the training has been completed.

1.6 COORDINATION

A. Coordinate pipe sleeve installations for foundation wall penetrations.
B. Coordinate layout and installation of piping with equipment and with other installations.
C. Coordinate pipe fitting pressure classes with products specified in related Sections.
D. Coordinate with requirements for firestopping for fire and smoke wall and floor assemblies.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Copper Tube and Fittings:
   1. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
   2. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
   3. Wrought-Copper Fittings: ASME B16.22.
   4. Wrought-Copper Unions: ASME B16.22.
   5. Solder Filler Metals: ASTM B 32, 95-5 tin antimony.
   6. At the contractor’s option, Nibco Press System or Viega may be used on domestic or hydronic water in lieu of soldered copper fittings. Fittings shall be suitable for working pressures to 200 psig CWP and maximum operating temperatures to +230 degrees F. The fitting manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of tools, marking and preparation of pipe, and installation of products. The representative shall periodically visit the job site and review contractor’s installation and verify the correct procedures are being followed.
B. Steel Pipe and Fittings:
   1. Steel Pipe, NPS 2 and Smaller: ASTM A 53, Type S (seamless), Grade A, Schedule 40, black steel, plain ends.
   2. Steel Pipe, NPS 2-1/2 through NPS 12: ASTM A 53, Type E (electric-resistance welded), Grade A, Schedule 40, black steel, plain ends.
   3. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, Schedule 40, black steel; seamless for NPS 2 and smaller and electric-resistance welded for NPS 2-1/2 and larger.
   4. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250.
   5. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
   6. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300.
   7. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, 125, and 250; raised ground face, and bolt holes spot faced.
   8. Wrought-Steel Fittings: ASTM A 234 (ASTM A 234M), Standard Weight.
   9. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.
b. End Connections: Butt welding.
c. Facings: Raised face.

10. Grooved Mechanical-Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47, Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders designed to accept grooved end couplings.
11. Grooved Mechanical-Joint Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
12. Spherical, Rubber, Flexible Connectors: Fiber-reinforced rubber body, steel flanges drilled to align with Classes 150 and 300 steel flanges; operating temperatures up to 220 deg. F and pressures up to 150 psig.
13. Gasket Material: Thickness, material, and type suitable for fluid to be handled; and design temperatures and pressures.

C. Polyethylene PEX Pipe and Fittings:
1. 2” and smaller Cross linked Polyethylene Uponor PEX a Pipe: ASTM 877, SDR 9 with oxygen diffusion penetration per DIN 4726. Fittings consisting of Engineered polymer ASTM F 1960 Cold expansion fitting with reinforcing ring. Two piece compression fitting ASTM 877 with cold expansion fitting with reinforcing ring.
2. Groove Fittings for PEX Tube: One-piece brass F1960 cold-expansion fitting and groove fitting CSAB242-05.

2.2 COOLING CONDENSATE DRAIN PIPING

A. Above Grade: Drain piping shall be type “M” copper, ASTM B 88, with cast-copper solder-joint drainage fittings, ANSI B 16.23, or wrought-copper solder joint, ANSI B 16.29, non-corrosive past flux and 50/50 tin-lead solder ASTM B 32.
1. Where permitted, schedule 40 PVC or ABS, solvent weld fittings.

2.3 VALVES

A. General-Duty Valves, NPS 2 and Smaller: Bronze body, ball type, threaded ends, unless otherwise indicated. Valve pressure and temperature ratings not less than indicated and as required for system pressures and temperatures. Valve size shall be the same size as upstream pipe, unless otherwise indicated. Quarter-turn lever handle valve actuators. Extended valve stems on insulated valves.
B. Safety Valves: Diaphragm-operated, bronze or brass body with brass and rubber, wetted, internal working parts; shall suit system pressure and heat capacity and shall comply with the ASME Boiler and Pressure Vessel Code, Section IV.
C. Pump Discharge Valves: 175-psig maximum working pressure, 250 deg F maximum operating temperature, cast-iron or ductile iron body, replaceable bronze disc with EPDM seat insert, bronze seat, stainless steel stem and spring, and “Teflon” packing. Valves shall have NPT, grooved or flanged connections and straight or angle pattern. Features shall include non-slam check valve with spring-loaded weighted disc, pressure taps, and calibrated adjustment feature to permit regulation of pump discharge flow, shutoff and valve design to permit repacking under full system pressure.

2.4 METERS AND GAGES

A. Liquid-In-Glass Thermometers
1. Description: ASTM E 1.
2. Range: Temperature range of 40 to 240 deg F, with 2-degree scale divisions (minus 18 to plus 70 deg C, with 1-degree scale divisions). Accuracy shall be plus or minus 1

percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

3. Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches long.
4. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
5. Tube: Red or blue reading, organic-liquid filled with magnifying lens.
6. Scale: Satin-faced nonreflective aluminum with permanently etched markings.
7. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

B. Bimetal Dial Thermometers
1. ASME B40.3; direct-mounting, universal-angle dial type.
2. Case: Stainless steel with 5-inch diameter lens.
3. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
4. Element: Bimetal coil.
5. Scale: Satin-faced nonreflective aluminum with permanently etched markings.
6. Stem: Stainless steel for separable socket, of length to suit installation.

C. Thermometer Wells
1. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.
2. Material: Brass, for use in copper piping.
3. Material: Stainless steel, for use in steel piping.
4. Extension-Neck Length: Nominal thickness of 2 inches, but not less than thickness of insulation. Omit extension neck for wells for piping not insulated.
5. Insertion Length: To extend 2 inches into pipe.
6. Cap: Threaded, with chain permanently fastened to socket.

D. Pressure Gages
1. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
2. Case: Drawn steel, brass, or aluminum with 4 ½” diameter, glass lens.
3. Connector: Brass, NPS ¼.
4. Scale: White-coated aluminum with permanently etched markings
5. Accuracy: Grade A, plus or minimum 1 percent of middle 50 percent of scale.
6. Range: Comply with the following:
    a. Fluids under Pressure: Two times the operating pressure.

E. Pressure Gage Fittings
1. Hydronic Indicator: Brass body with four inlets and valves by Flow Conditioning Corp. (314) 878-7898 or equal.
2. Valves: NPS ¼ brass or stainless-steel needle type
3. Syphons: NPS ¼ coil of brass tubing with threaded ends.
4. Snubbers: ASME B40.5, NPS ¼ brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

F. Test Plugs
1. Description: Nickel-plated, brass –body test plug in NPS ½ fitting.
2. Body: Length as required to extend beyond insulation.
3. Pressure Rating: 500 psig minimum.
4. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.

5. Core Material for Air, Water, and Gas: 20 to 200 deg F (Minus 7 to plus 93 deg C), chlorosulfonated polyethylene synthetic rubber.
6. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.
7. Test Kit: Pressure gage and adapted with probe, two bimetal dial thermometers, and carrying case.

G. Pressure Gage and Thermometer Ranges: Approximately two times the system's operating conditions.

2.5 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 150-psig working pressure; 225 deg F operating temperature; manually operated 1/2" full port ball valve with gooseneck down; with NPS 1/2 discharge connection and NPS 1/2 inlet connection, and chained cap hose connection.

B. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150-psig working pressure; 240 deg F operating temperature; with NPS 1/4 discharge connection and NPS 1/2 inlet connection.

C. Heating Water Bladder Style Expansion Tanks: Welded carbon steel, rated for 125-psig working pressure and 240 deg F maximum operating temperature. Provide taps for pressure gage and air-charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Fabricate and test tank with taps and supports, and label according to the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

D. High flow bypass filter feeders across the hot water pumps and chilled water pumps as indicated on the plans. Basis of design shall be Vector Industries FA-900AL with stainless steel basket & "Sock" filter bag (5 micron), or equal. Unit shall have adjustable leg set from factory; it shall not be acceptable for unit to be set on floor. Installation shall comply with manufacturer's installation requirements. Provide with one additional 5 micron filter bag per filter feeder for owner's use.

E. Heating Water Air Separator: Welded black steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature; perforated stainless-steel air collector tube designed to direct released air automatic air vent; tangential inlet and outlet connections; threaded connections for 2-inch NPS (DN50) and smaller; flanged connections for 2-1/2-inch NPS (DN40) and larger; threaded blow-down connection. Provide units in sizes for full-system flow capacity.

F. Y-Pattern Strainers: 125-psig working pressure; cast-iron body (ASTM A 126, Class B), flanged ends for NPS 2-1/2 and larger, threaded connections for NPS 2 and smaller, bolted cover, perforated stainless-steel basket, and bottom drain connection.

G. Propylene Glycol: Industrially inhibited propylene glycol-based heat transfer fluid, Dowfrost HD with Inhibitor and Deionized Water (or prior approved equal), with the following features:
1. Industrially inhibited propylene glycol (phosphate-based).
2. Dyed (bright yellow/green) to facilitate leak detection.
3. Easily analyzed for glycol concentration and inhibitor level.
4. For systems containing more than 250 gallons of fluid, annual analysis must be provided free of charge by the fluid manufacturer.
5. Fluid must pass ASTM D1384 (less than 0.5 mils penetration per year for all systems metals).
6. Reserve alkalinity of the fluid must be at least 15 to provide long-term resistance to acidic pH.

2.6 BOILER CIRCULATORS, HOT WATER & CHILLED WATER PUMPS

A. See section 23 2123 HVAC Hydronic Pumps.

2.7 BOILER COMBUSTION AIR MATERIALS & INSTALLATION

A. Furnish and install schedule 40 PVC combustion air for the boilers where shown on the Drawings and terminate with gooseneck with removable bird screen. Type, size, and performance shall be as per manufacturer's recommendations.

B. Provide & install accessories as scheduled on the plans.

2.8 NATURAL GAS FIRED NEAR CONDENSING BOILER BURNER UNITS

A. SUBMITTALS

1. In accordance with Contract Documents. Minimum product data to include:
    a. Capacities, accessories and options included with boiler.
    b. General layout, dimensions, size and location of all required field connections.
    c. Electrical characteristics - provide wiring diagrams that are specific to this project.
    d. Weight and mounting loads.
    e. Manufacturer's installation and start-up instructions.
    f. Equipment Operation and Maintenance Manuals and control device cut-sheets.

B. QUALITY ASSURANCE

1. Use an adequate number of skilled workers, trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements, pertinent contract documents, and methods needed for proper performance of the work described therein.
2. Provide the services of a manufacturer's factory-authorized representative to inspect and verify proper installation of this equipment, and to provide equipment start-up and operator training.

C. DELIVERY, STORAGE, AND HANDLING

1. In accordance with Contract Documents.
2. Accept equipment and accessories in Factory shipping packaging. Inspect for damage. Keep boiler in a vertical position from time of delivery to final installation.
3. While stored, all equipment must be protected from external elements such as inclement weather, job site construction activity, etc. Protect equipment from damage by leaving packaging in place until installation.

D. WARRANTY

1. The boiler shall come with the warranties stated below. Warranty period shall be one (1) year from date of start-up or eighteen (18) months from date of shipment, whichever comes first.
    a. Heat exchanger: 5-year limited warranty, and a 20-year warranty against thermal shock.
    b. Burner: 10-year limited warranty.
    c. All other parts: 1-year limited warranty.

E. MANUFACTURER

1. Thermal Solutions Boiler, Evolution Model EVS 1500. Refer to the Equipment Schedule in the Contract Documents for specific design and performance criteria.
2. It shall be the responsibility of the Contractor to insure that any substituted equipment is equivalent in fit, form and function to the specified equipment. The cost of any additional work caused by the substitution of equipment shall be borne by the Contractor.
3. Or engineer prior approved equal.

F. GENERAL REQUIREMENTS

1. Boiler
    a. The boiler shall be a factory-packaged unit, complete with jacket, gas manifold, burner and controls mounted and wired, as specified in this Section. The boiler shall be factory assembled and fire tested. Boiler connections shall be limited to

the water supply & return, relief valve and boiler drains, fuel input, electrical power, exhaust vent and air inlet (as specified/shown in contract documents).

b. The boiler shall be constructed in conformance to ASME Section IV and UL 795. The boiler shall bear the ASME “H” stamp and be National Board Listed for 160 psi working pressure and 250 deg F. The gas train and safety controls shall conform to requirements of UL 795 and ASME CSD-1.

c. The complete boiler shall be factory fire tested by the manufacturer and a copy of the fire-test report shall be supplied with the boiler.

d. The boiler heat exchanger shall be constructed in accordance with Section IV of the ASME code with straight copper tubes having extruded, integral fins. Fin spacing shall be at least seven (7) fins per inch. Each copper tube shall have a minimum wall thickness of .072”. All tubes shall be rolled securely into the headers (top and bottom). There shall be no bolts, gaskets, “O-Rings”, welding or brazing used in the header construction. Removable access plugs shall be included in the design of the heat exchanger to allow for access (cleaning and inspection) and replacement of each individual tube. The heat exchanger shall encompass the entire burner and be enclosed in stainless steel inner shells. Stainless steel “V” Baffles shall be used between each tube to provide uniform heat distribution of the flue gases across the entire heat exchanger. The heat exchanger shall be of sufficient size and design to ensure effective, non-limiting control of the water flow rate and velocity through each tube at all load levels.

e. ***The heating surface of the heat exchanger shall be no less than 7.1 ft2 per boiler horsepower. The boiler heat exchanger shall have no less than 0.80 inch of tube per 1000 btuh of input capacity. List the quantity and length of the individual tubes on the shop drawing submittal. Boiler manufacturers that do not meet the total tube length listed above with a standard boiler size shall provide a larger size unit and shall derate the burner for the capacity listed in the schedule.***

f. The boiler shall be contained in a minimum 16-gauge negative pressure steel jacket protected with a powder-coated finish. The boiler control panel shall be non-pressurized allowing boiler operation with any jacket panels removed. Hinge-less front and rear access panels shall be provided for easy access to the operating controls and to eliminate electrical code “swing radius” clearance issues.

g. The operating sound level for the boiler shall not exceed 50 dBA.

h. See plans for electrical input to the boiler. The manufacturer will mount the control transformer and fuses inside the boiler control panel. Single-point electrical hook-up for each boiler shall be provided. Separate power wiring and control wiring is not acceptable. A dedicated disconnect shall be provided for each boiler.

G. Combustion System

a. The burner shall be a radiant non-corroding ceramic burner, with no moving parts. Double-meshed screen, fiber-metal mats, aluminized or stainless steel construction of the burner will not be accepted. The burner shall fire in a full 360-degree pattern providing uniform heat transfer across the entire heat exchanger. A viewing port shall be provided for visual observation of burner performance. Burner shall require no maintenance, inspection or service.

b. Burner operation shall provide infinite Modulation with minimum 3:1 turn down utilizing a Variable Frequency Drive and air-fuel ratio control gas valve for dependable, repeatable modulation and precise combustion control. The boiler will

be equipped with a non-sparking blower manufactured with a cast-aluminum housing. Dampers, linkages or a single-speed fan are not acceptable.

c. An interrupted-type mixed fuel/air pilot system with electric spark-to-pilot ignition shall be used. The pilot system shall use a UV scanner to prove pilot prior to energizing the main gas valves. Hot surface ignition systems and flame rods are not acceptable.

d. The entire ignition and firing control sequence shall be monitored by a UL approved commercial-type microprocessor based integrated flame safeguard burner control with first out fault annunciation and operating sequence and diagnostic indicator lights. The burner control shall incorporate both pre-purge and post-purge timing functions. In the event of ignition pilot and/or main flame failure a burner “lockout” will occur requiring a manual reset of the burner control. It shall also recognize the Proof of Closure switches on the gas valves (if DB&B w/POC).

e. The combustion air blower shall be equipped with a replaceable combustion air filter, 99% efficient to one micron to protect the burner from contamination. A delta-P type pressure switch shall be provided to alert the boiler operator of a dirty filter condition. Air inlet dampers and vacuum relief dampers are not required for proper operation. A combustion airflow switch shall be provided.

f. The gas train shall be UL/FM/CSD-1 compliant and capable of accepting up to 5 psi Natural Gas. Additional step down regulators will be permitted. The gas train shall consist of a pilot gas pressure regulator, high and low gas pressure switches (each with manual reset), automatic main and redundant gas valve - Motorized automatic main and redundant gas valve and a normally open vent valve in between (if DB&B) - Motorized automatic main and redundant gas valve w/ Proof of Closure contacts and a normally open vent valve in between (if DB&B w/POC), leak test valves downstream of each gas valve, a manual shut off valve upstream of burner and downstream of last gas valve. The main gas valve shall perform the functions of safety shutoff, constant pressure regulation and air-fuel ratio control.

2. Operating Control

a. The boiler shall be equipped with an onboard microprocessor based Electronic Control Module (ECM) featuring a 2-line, 16-character LCD display and user-friendly menu selections. All safety, operating and ignition controls shall be integrated in the ECM. The ECM shall include a diagnostic menu that provides an alarm history of the last ten (10) alarm messages and a low boiler inlet water temperature alarm history. The ECM shall have a user-friendly menu that allows easy selection of desired operating temperature, upper and lower temperature set-point limits, burner on/off thresholds PID control loop characteristics and local or remote operating modes. The ECM shall have an outdoor temperature reset function to allow the boiler operating temperature to vary based on outdoor air temperature. The ECM shall be capable of accepting a 0-10 vdc remote signal for changing temperature set-points and/or remote modulation control. Operating variables such as boiler inlet & outlet water temp, remote system temp, outdoor air temp, firing rate set-point, modulating percent and mixing valve demand percent are accessible on the display. The display shall also automatically present boiler sequence messages, alarms, and hold and lockout messages. Design features of the ECM shall include multi-level password security, outdoor temperature reset and DHW prioritization. The ECM shall provide for control of a dedicated boiler pump, up to two system pumps and a mixing valve to insure proper inlet water temperature to the boiler. The EMC shall be capable of providing peer-to-peer

communication and lead/lag sequencing control (with auto rotation) of up to eight (8) boilers using standard RJ11 phone cables. The ECM shall also be capable of communicating with a BAS/BMS using Johnson Controls Metasys N2 communication protocol.

3. Water Trim
   a. Water trim devices including an ASME rated pressure relief valve set at scheduled psig, combination water pressure and temperature gage (furnish graduated pressure gauge scale from 1-1/2 to 3 times of pressure relief valve setting) and water flow switch to prevent burner operation during low water flow conditions shall be provided in the boiler outlet piping. An adjustable high limit temperature controller with manual reset to prevent water temperature from exceeding a safe system temperature and an Auxiliary Low Water Cutoff to provide redundant low water protection shall both be provided.
4. Vent & Intake Air Connections
   a. The boiler shall be designed to accommodate sealed, direct, or conventional venting options. The flue duct shall be AL 29-4C, positive pressure type vent material, provided & installed by VC.
   b. For sealed combustion, air intake piping shall be PVC that is sealed and pressure tight. Pipe must be at least the same size as the air inlet connection on the boiler.

H. PERFORMANCE
1. Boiler efficiency shall be as stated in the Equipment Schedule of the Contract Documents.
2. The burner shall emit no more than 9 ppm NOx and 50 ppm CO (corrected to 3% O2) at all firing rates.
3. Provide services of a manufacturer's authorized representative to perform combustion test including boiler firing rate, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide, percent oxygen, percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output. Perform test at minimum, mid-range, and high fire.

I. INSTALLATION
1. In accordance with Contract Documents and boiler manufacturer's printed instructions.
2. Flush and clean the boiler upon completion of installation in accordance with manufacturer's start-up instructions. The boiler must be isolated when any cleaning or testing of system piping is being performed.
3. Install skid plumb and level, to plus or minus 1/16 inch over base.
4. Maintain manufacturer's recommended clearances around and over equipment, and as required by local Code.
5. Arrange all electrical conduit, piping, exhaust vent, and air intake with clearances for burner removal and service of all equipment.
6. Connect exhaust vent to boiler vent connection.
7. If shown in Contract Drawings, connect full sized air inlet vent to flanged connector on boiler.
8. Connect fuel piping in accordance with NFPA 54. Pipe size to be the same, or greater, than the gas train inlet connection.
9. Use full size (minimum) pipe/tubing on all gas vent connections.
10. Connect water piping, full size, to supply and return connections.
11. Install all piping accessories per the details on the contract drawings.

12. Install discharge piping from relief valves (open termination for viewing) and all drains to nearest floor drain.
13. Provide necessary water treatment to satisfy manufacturer's specified water quality limits.

J. Provide & install accessories as scheduled on the plans.

2.9 FLOW CONTROL AND STRAINER VALVES

A. Furnish and install pressure-compensating flow control valves in a union (or flanges)/flow-control-device/ball-valve configuration. One piece configuration for valves 3" and smaller. Valves are to be installed where indicated on plans and in hot water heating piping systems, serving hot water coils. Flow control valves will be installed in the return line. All valves shall have access capability to allow field-exchange of internal components without removing valve body from pipeline. All valves shall be permanently marked to show direction of flow, flow rate, and pressure range.

B. Furnish and install an in-line strainer for each flow control valve furnished that is 2" and smaller. Strainer to be in a union/strainer/ball valve configuration.

C. Furnish and install as part of each flow control valve and strainer valve a Pete's plug ¼" MPT fitting to receive either a temperature or pressure probe. Fitting shall be solid brass.

D. Flow control valve shall be Pro Hydronics, Autoflow FV Series, Griswold Controls, or approved equal.

E. Strainer valves shall be Pro Hydronics, Autoflow SV Series, Griswold Controls, or approved equal.

F. If any flow controls are found to be installed backwards when balancing is performed, entire autoflow valve shall be replaced by this contractor.

2.10 HOT WATER CABINET UNIT HEATERS

A. Furnish and install cabinet unit heater(s) where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Cabinet unit heater shall be factory-assembled of type as indicated on plans. The motors shall be 120 volt, single phase, multi-speed. Units shall be provided with lock type removable front access panel. Panel shall have custom color factory baked enamel finish, custom color to be selected by Architect.

C. Make all hot water heating connections. This includes piping, valves, strainers, air vents, thermometers, immersion bulbs, flow switches, unions, etc.

D. Controls, sensors, and control valve will be provided under Temperature Control Section.

E. Power wiring will be provided under Division 26.

F. Provide/install all accessories as scheduled or needed for proper operation

2.11 HOT WATER FINNED TUBE RADIATION

A. The contractor shall furnish and install finned tube radiation as indicated and scheduled on the plans. Units shall be installed in a neat and workmanlike manner in accordance with the specifications and the manufacturer's recommendations. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Radiation shall be complete with heating elements, hangers, supports, and accessories.

C. Enclosure shall have custom color factory baked enable finish, custom color to be selected by the Architect.

D. Heating Elements

1. Elements shall be constructed of copper tubes expanded and rolled into cast brass headers, aluminum fins, steel side plates and fin tube supports.

2. Fins shall have integral fin collars which space the fins and provide a fin-to-tube surface firmly bonded to the tube by mechanical expansion of the tube to help assure durability, eliminate the noise from loose fins and assure performance at cataloged ratings.
3. All elements shall withstand 100 pounds air pressure factory tested under water.
4. Elements shall be capacities and characteristics as scheduled on drawings. Lineal feet indicated shall be the actual finned length.

E. Make all hot water heating connections. This includes piping, valves, strainers, air vents, thermometers, immersion bulbs, flow switches, unions, etc.
F. Controls, sensors, and control valve will be provided under Temperature Control Section.
G. Provide & install accessories as scheduled on the plans.

2.12 HOT WATER RADIANT CEILING PANELS

A. Provide where indicated on the plans, radiant ceiling panels, including all piping, valves, etc.
B. Panels shall be constructed of 0.032" thick aluminum face plate with ½" copper serpentine coil metallurgically bonded to face plate. Unit shall be covered with 1" thick, ¾ pound density glass fiber pad in ceiling space.
C. Panels shall be standard flat panels, size as indicated on plans, for installation in standard lay-in ceiling. Ceiling grid and suspension system will be provided under the General Section of the specification. Where indicated, provide a surface-mounting frame for surface installation. Connections between panels and valves will be insulated soft temper copper.
D. Panel shall be unperforated with silk screen finish selected by the Architect.
E. Make all hot water heating connections. This includes piping, valves, strainers, air vents, thermometers, immersion bulbs, flow switches, unions, etc.
F. Controls, sensors, and control valve will be provided under Temperature Control Section.
G. Provide & install accessories as scheduled on the plans.

2.13 SPARE PARTS

A. Provide Each Bypass Filter Feeder with one additional 5 micron "sock" filter bag for owner's use.

B. Provide Cabinet Unit Heaters with one additional set of disposable filters.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Coordinate applications below with materials specified in this Section. Pipe sizes at which joining methods change are between NPS 2 and NPS 2-1/2 (DN 50 and DN 65). Adjust this change point to suit personal preference. Soldered joints for pipes larger than NPS 2 (DN 50) may not meet system pressures.
B. Hot Water Heat Piping Systems: Type L drawn-temper copper tubing with soldered joints.
C. Hot Water Heat Piping Systems: Schedule 40 steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints and fittings for 2-1/2 inch and larger.
D. Hot Water Heat Piping Systems: Schedule 40 steel pipe with mechanical couplings.
E. Hot Water Heat Piping Systems: Type L drawn-temper copper tubing with mechanical couplings.
F. Hot Water Piping Systems: Uponor SDR 9 PEX-A tubing with Uponor one-piece cold expansion F1960 fittings. Crimp ring fittings shall not be acceptable. Uponor fittings must be used with Uponor pipe and must meet all requirements to achieve full warranty coverage.

3.2 VALVE APPLICATIONS

A. Unless otherwise indicated, use the following general-duty valve types for applications indicated:
1. Shutoff Duty: Ball, and butterfly valves.

2. Throttling Duty: Ball, and butterfly valves.

B. Install shutoff duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.

C. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.

D. Install calibrated plug or automatic flow control valves on the outlet of each heating or cooling element and elsewhere as indicated to facilitate system balancing.

E. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

F. Install check valves at each pump discharge and elsewhere as required to control flow direction.

G. Install safety relief valves on hot-water generators and elsewhere as required by the ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to floor. Comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, for installation requirements.

3.3 METER AND GAGE INSTALLATION

A. Calibrate and install meters, gages, and accessories according to manufacturer's written instructions for applications where used.

B. Thermometer Installation

1. Install thermometers and adjust vertical and tilted positions.
2. Install in the following locations:
   a. As shown on piping details of plans.
3. Install remote–reading dial thermometers in control panels with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.
4. Install thermometer wells in vertical position in piping tees where test thermometers are indicated.
   a. Install with stem extending a minimum of 2 inches into fluid.
   b. Fill wells with oil or graphite and secure caps.

C. Pressure Gage Installation

1. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
2. Install dry-type pressure gages in the following locations:
   a. As shown on piping details of plans.
3. Install liquid-filled-type pressure gages at suction and discharge of each pump.

D. Install pressure-gage needle valve and snubber in piping to pressure gages.

3.4 HYDRONIC PIPING INSTALLATIONS

A. Install piping according to Section 23 0510 "Basic Mechanical Materials and Methods."

B. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

C. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

D. Install piping at a uniform grade of 0.2 percent upward in direction of flow. Install condensate piping at a uniform grade of ¼ inch per foot downward in direction of flow.

E. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

F. Install branch connections to mains using tee fittings in main pipe, with the takeoff coming out the bottom of the main pipe. For up-feed risers, install the takeoff coming out the top of the main pipe.

G. Install unions in pipes 2-inch NPS (DN50) and smaller, adjacent to each valve, at final connections of each piece of equipment, and elsewhere as indicated. Unions are not required at flanged connections.
H. Install flanges on valves, apparatus, and equipment having 2-1/2-inch NPS (DN65) and larger connections.
I. Install flexible connectors at inlet and discharge connections to pumps (except in-line pumps) and other vibration-producing equipment.
J. Install strainers on supply side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger.
K. Anchor piping for proper direction of expansion and contraction.
L. Uponor PEX-a piping with F1960 expandable fittings shall be installed in accordance with Uponor's Hydronic Piping Design Assistance Manual to ensure a 25 year system warranty.
M. Install in floor heat tubing as shown on plans and per manufacturer's requirements.

3.5 HANGERS AND SUPPORTS

A. Piping support must account for expansion and contraction, vibration, and dead load of piping and its contents, and seismic bracing requirements.
B. Hanger, support, and anchor devices shall comply with requirements below for maximum spacing of supports. Install the following pipe attachments:
    1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
    2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
    3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
    4. Spring hangers to support vertical runs.
    5. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
        a. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
        b. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
        c. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
        d. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
        e. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
        f. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
    6. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
        a. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
        b. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
        c. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
        d. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
        e. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
        f. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
    7. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.
    8. PEX-a Piping Hanger Spacing: Install hangers for PEX-a piping with the following maximum spacing:
        a. 1 inch and below: Maximum span, 32 inches.
        b. 1-1/2 inch and above: Maximum span, 48 inches.
    9. PEX-a Piping Hanger Spacing with PEX-a Support Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:

a. Maximum span, 8 feet.

10. PEX-a Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor. Install mid-story guides between each floor.
11. Pipe Joint Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for F1960 connections.

3.6 PIPE JOINT CONSTRUCTION

A. Refer to Division 23 Section "Basic HVAC Materials and Methods" for joint construction requirements for soldered and brazed joints in copper tubing; threaded, welded, and flanged joints in steel piping.
B. Mechanical Joints: Assemble joints according to fitting manufacturer's written instructions.

3.7 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual (not automatic) full port ball valve operated air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting. Install ball isolation valves with chained caps.
   1. Existing Area A & B hot water heating system being tied into (100% water):
      a. Existing system is 100% water, no salvage necessary.
      b. The plumbing contractor shall be responsible for cleaning and flushing the new hot water heating system piping. The existing hot water heating system shall be drained as necessary for proposed tie ins and filled with new heating solution, no cleaning and flushing on existing piping.
      c. Upon completion of the proposed work & system flushing, the new 100% inhibited water solution shall be pumped back in.
      d. After proposed work is complete, the plumbing/hydronics contractor is to provide a complete analysis of the hot water heating system to confirm proper water treatment. Submit analysis/recommendations to Sichmeller engineering & owner. If solution analysis indicates solution is not satisfactory, this contractor to make adjustments as recommended by inhibitor suppler & retest until analysis is satisfactory.
   2. New hot water heating system serving addition and remodeled areas of B (30% glycol):
      a. The plumbing contractor shall be responsible for cleaning and flushing the new hot water heating system piping prior to pumping in new heating solution/startup.
      b. After proposed work is complete, the plumbing/hydronics contractor is to provide a complete analysis of the hot water heating system to confirm proper glycol % and treatment. Submit analysis/recommendations to Sichmeller engineering & owner. If solution analysis indicates solution is not satisfactory, this contractor to make adjustments as recommended by glycol suppler & retest until analysis is satisfactory.
   3. Install automatic air vents in mechanical equipment rooms only at high points of system piping, at heat-transfer coils, and elsewhere as required for system air venting.

3.8 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be same as for equipment connections.
B. Install control valves in accessible locations close to connected equipment.
C. Install flow control valves and strainer valves as shown on piping details.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
B. Prepare hydronic piping and perform testing according to ASME B31.9. Prepare written report of testing.

3.10 ADJUSTING AND CLEANING

A. Consult with and comply with boiler manufacturer's recommendations.

B. After completing systems installation, including outlet fittings and devices, inspect finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

C. Flush hydronic piping systems with clean water. Remove and clean or replace strainer screens. After cleaning and flushing hydronic piping systems, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.

D. Preparation for testing: Prepare hydronic piping in accordance with ASME B 31.9.

E. Testing: Test hydronic piping as specified in ASME B 31.9 "Building Services Piping."

F. System Cleaning:

1. Fill the entire system with clean, fresh water and properly vent. Repair piping leaks as early in this procedure as they are discovered. Inspect existing piping system and notify engineer immediately for any leaks requiring repairs. With valves positioned by bypass the boiler and terminal equipment, start the pump to circulate water through the system. Check strainers at pumps and at terminal equipment (new and existing) frequently and clean as often as needed. If the water is extremely dirty or murky, flush continuously, using the system pump, until the water being flushed out of the pipe loop has become clear. To flush in this manner requires care to be certain that make-up water is being added fast enough to replace what is being flushed out. Accomplish this by opening the make-up water bypass valve around the automatic pressure reducer valve and adjust the manual valve so that the pump suction pressure gauge continues to indicate the same positive pressure that existed before the manual drain and make-up valves were opened. Continue for at least two hours. Once the water is clear and debris flushed out, stop the pump.
2. To complete the cleaning, fill the system with fresh water, adding a cleaning agent such as trisodium phosphate (TSP). Disconnect all power to the terminal units so that they will not operate while the system is being cleaned. Then circulate cleaning solution throughout the system, with boiler controls temporarily adjusted to raise the solution temperature to about 105 deg F to 110 deg F. Do not allow the temperature to rise above 110 deg F. Alternate operation of the primary and standby pumps and circulate the warm solution for several hours. Then turn off the boiler and pump, completely drain the system, and refill with fresh water. Repeat the cleaning process only if there is indication of foreign matter still in the system or if a test of the water indicated that it is slightly acid.
3. Water should be slightly alkaline, with a pH no higher than 8.0 and no lower than 7.0.
4. Add glycol to hydronic piping system to provide a total of 30% by volume.

G. Install laminated engraved placard near boilers with 1" engraved letters indicating glycol type & concentration.

H. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

I. Chemical Treatment: Provide a water analysis prepared by chemical treatment supplier to determine type and level of chemicals required to prevent scale and corrosion. Perform treatment after completing system testing and retest as necessary. If solution analysis is not satisfactory, make adjustments as recommended by glycol supplier and retest as necessary until analysis is satisfactory.

3.11 COMMISSIONING

A. Fill system and perform initial chemical treatment.

B. Check expansion tanks to determine that they are not air bound and that system is completely full of water.
C. Perform these adjustments before operating the system:
   1. Open valves to fully open position. Close coil bypass valves.
   2. Check pump for proper direction of rotation.
   3. Set automatic fill valves for required system pressure.
   4. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils are calling for full flow.
   6. Check operation of automatic bypass valves.
   7. Check and set operating temperatures of boilers, chillers, and cooling towers to design requirements.
   8. Lubricate motors and bearings.

3.12 MISCELLANEOUS CONNECTIONS

A. Make all hydronic connections. This includes boiler connections, connections of heating coils to equipment supplied and/or mounted under HVAC Section. This includes piping, valves, strainers, air vents, thermometers, immersion bulbs, flow switches, drains, unions, etc.
B. Install all control valves supplied by Automatic Temperature Control Contractor.

3.13 AUTOMATIC TEMPERATURE CONTROL

A. 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 23 0900, CONTROLS & CONTROL SEQUENCES Temperature Control Contractor and in strict accordance with the manufacturer's recommendations.

END OF SECTION 23 2113

SECTION 232123
HVAC HYDRONIC PUMPS

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. The Work covered in this section of the Specifications is intended to include the furnishing of all equipment, materials and labor reasonably incidental to the complete operating installation of the base mounted end-suction ground loop pumps and pertaining equipment as indicated on the drawing.

B. This Section includes the following:
   1. In-Line Circulator Pumps for Boilers
   2. Base Mounted End-Suction Pumps Rated for VFD Application.

1.3 PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to system’s maximum operating pressure at point where installed, but not less than specified.

1.4 SUBMITTALS

A. Shop Drawings: Shop drawings as specified in Section 230500 shall include the following:
   1. In-Line Circulator Pumps for Boilers.
   2. Base Mounted End-Suction Pumps Rated for VFD Application (heating loop).

B. Product Data: Include certified performance curves and rated capacities; furnished specialties; final impeller dimensions; and accessories for each pump indicated. Indicate pump's operating point on curves.

C. Shop Drawings: Shop drawings as specified in Section 230500 shall include the following:
   1. Power, signal, and control wiring diagrams differentiating between manufacturer-installed wiring and field-installed wiring.

D. Show pump layout and connections. Include Setting Drawings with templates for installing foundation and anchor bolts and other anchorages.

E. Operation and maintenance data including startup instructions.

1.5 QUALITY ASSURANCE

A. UL Compliance: Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps," for construction requirements.

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. Single-Source Responsibility: Obtain each category of pumps from one source and by a single manufacturer.

D. Provider shall be responsible for providing certified factory authorized equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump’s balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the Engineer.

PART 2 - PRODUCTS

2.1 IN LINE CIRCULATOR PUMPS

A. The contractor shall furnish and install inline pumps as illustrated on the plans and in accordance with the following specifications:
   1. The pumps shall be of the horizontal, permanently lubricated type, specifically designed and guaranteed for quiet operation.
   2. 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 to be carbon on silicon carbide. The motor shall be non-overloading at any point on the pump performance curve.

3. 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.
4. Pumps to be suitable for 225°F (107°C) operating temperature at 150 psig (10 bar) working pressure.

2.2 BASE MOUNTED END-SUCTION PUMPS RATED FOR VFD APPLICATIONS

A. Furnish circulating pumps rated for VFD application where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. MANUFACTURERS

1. The specifying engineer reserves the right to specify a primary supplier / lead spec manufacturer on all supplied schedule and specification documents. These primary suppliers have led their respective industry in research and development and their products have had proven track records in the field. These primary suppliers, in the opinion of this engineering firm, produce a superior product to the alternately listed manufacturers. The contractor may choose to supply equivalent equipment as manufactured by the alternately specified manufacturer. This alternately specified equipment shall be supplied on a deduct alternate basis and based on the approval of the supplied alternate manufacturer's submittals. The use of a primary supplier and deduct alternates protects the specifying engineer's design concept, but allows for a check-and-balance system to protect the post-commissioning owner.
2. Contractor shall furnish new end suction long coupled pumps for hot water heating systems as indicated on the drawings. Pumps shall manufacturer as specified under base bid. Equivalent units as manufactured by other manufacturers may be submitted as deduct alternates. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings. Pump substitutions shall be provided with connection sizes equal to those scheduled. Pump connections shall not be downsized. Pump substitutions shall not be provided at efficiencies less than those scheduled.
3. Or engineer prior approved equal.

C. COMPONENTS

1. The pumps shall be long coupled, base mounted, single stage, end suction, vertical split case design, in cast iron stainless steel fitted, specifically designed for quiet operation. Suitable standard operations at 225°F and 175 PSIG working pressure or optional operations at up to 250°F and 250 PSIG working pressures. Working pressures shall not be de-rated at temperatures up to 250F. The pump internals shall be capable of being services without disturbing piping connections, electrical motor connections or pump to motor alignment.
2. The pumps shall be composed of three separable components a motor, bearing assembly, and pump end (wet end). The motor shaft shall be connected to the pump shaft via a replaceable flexible coupling.
3. A bearing assembly shall support the shaft via two heavy-duty regreaseable ball bearings. Bearing assembly shall be replaceable without disturbing the system piping and shall have foot support at the coupling end. Pump bearings shall be regreaseable without removal of the bearings from the bearing assembly. Thermal expansion of the shaft toward the impeller shall be prevented via an inboard thrust bearing.
4. The bearing assembly shall have a solid SAE1144 steel shaft. A stainless steel shaft sleeve shall be employed to completely cover the wetted area under the seal.
5. Pump shall be equipped with an internally-flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Application of an internally flushed mechanical seal shall be adequate for seal flushing without requiring external flushing lines. Seal assembly shall have Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.
6. Bearing assembly shaft shall connect to a stainless steel impeller. Impeller shall be both hydraulically and dynamically balanced to ANSI/HI 9.6.4-2009, balance grade G6.3 and secured by a stainless steel locking cap screw or nut.
7. Pump should be designed to allow for true back pull-out allowing access to the pump's working components, without disturbing motor or piping, for ease of maintenance.

8. A center drop-out type coupling, capable of absorbing torsional vibration, shall be employed between the pump and motor. Pumps for variable speed application shall be provided with a suitable coupling sleeve. Coupling shall allow for removal of pump's wetted end without disturbing pump volute or movement of the pump's motor and electrical connections. On variable speed applications the coupling sleeve should be constructed of a neoprene material to maximize performance life.
9. An ANSI and OSHA rated coupling guard shall shield the coupling during operation. Coupling guard shall be dual rated ANSI B15.1 and OSHA 1910.219 compliant coupling guard and contain viewing windows for inspection of the coupling. No more than .25 inches of either rotating assembly shall be visible beyond the coupling guard.
10. Pump volute shall be of a cast iron design for heating systems with integrally cast pedestal volute support, rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. (Optional 250 PSIG working pressures are available and are 250# flange drilled.) Volute shall include gauge ports at nozzles, and vent and drain ports.
11. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Pump and motors shall be factory aligned, and shall be realigned after installation by the manufacturer's representative. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications and conform to standards outlined in EISA 2007.
12. Base plate shall be of structural steel or fabricated steel channel configuration fully enclosed at sides and ends, with securely welded cross members and fully open grouting area (for field grouting). The minimum base plate stiffness shall conform to ANSI/HI 1.3.8.2.1-2009 for grouted Horizontal Baseplate Design standards.
13. Pump shall be of a maintainable design and, for ease of maintenance, should use machine fit parts and not press fit components.
14. The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 9.6.4-2009 for recommended acceptable unfiltered field vibration limits (as measured per ANSI/HI 9.6.4-2009 Figure 9.6.4.2.3.1) for pumps with rolling contact bearings.
15. Pump manufacturer shall be ISO-9001 certified.
16. Each pump shall be hydrostatically tested 1.5 times the maximum rated working pressure and name-plated before shipment.
17. Pump shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

D. Provide accessories as scheduled on the plans.
E. Provide laser alignment in field per manufacturer's requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting performance of the pumps.
B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
C. Examine supporting structure for suitable conditions where pumps are to be installed.
D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps according to manufacturer's written installation and alignment instructions.
B. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
C. Support pumps and piping separately so piping is not supported by pumps.
D. Set base mounted pumps on concrete foundation. Provide & install inertia bases where shown on plans. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
    1. Support pump base plate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of ¾ to 1-1/2 inches between pump base and foundation for grouting.
    2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.3 ALIGNMENT

A. All base mounted end suction pumps must be laser aligned in field.
B. Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after piping connections have been made.
C. Comply with pump and coupling manufacturer's written instructions.
D. Adjust alignment of pump and motor shafts for angular and parallel alignment by 1 of 2 methods specified in the H.I.'s Standards for Centrifugal, Rotary & Reciprocating pumps, "Instructions for Installation, Operation, and Maintenance."
E. After alignment is correct, tighten foundation bolts evenly but not too firmly. Fill base plate completely with nonshrink, nonmetallic grout, with metal blocks and shims or wedges in place. After grout has cured, fully tighten foundation bolts.
F. Alignment Tolerances: According to manufacturer's recommendations.

3.4 CONNECTIONS

A. Install shutoff valve and strainer on pump suction and check valve and shutoff valve on pump discharge, except where other arrangement is indicated.
B. Install piping adjacent to machine to allow service and maintenance.
C. Connect piping to pumps. Install valves that are the same size as piping connected to pumps.
D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
E. Retain paragraph above or first two paragraphs below if specialty valves are required for vertical in-line pumps.
F. Install suction diffuser and shutoff valve on suction side of base-mounted pumps.
G. Install triple-duty valve on discharge side of base-mounted pumps.
H. Install flexible connectors on suction and discharge sides of base-mounted pumps and where indicated. Install between pump casing and valves, except where other arrangement is indicated.
I. Install thermometers where indicated.
J. Install pressure gages on pump suction and discharge. Install at integral pressure-gage tappings where provided.
K. Install temperature and pressure gage connector plugs in suction and discharge piping around each pump.
L. Install electrical connections for power, controls, and devices. Electrical power and control wiring and connections are specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

A. Check suction piping connections for tightness to avoid drawing air into pumps.
B. Clean strainers.
C. Set pump controls.

3.6 AUTOMATIC TEMPERATURE CONTROL

A. 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 23 0900, CONTROLS & CONTROL SEQUENCES Temperature Control Contractor and in strict accordance with the manufacturer's recommendations.

END OF SECTION 232123

SECTION 23 7000
VENTILATION AND AIR CONDITIONING

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. The work in this section of the specification and the accompanying drawings consists of performing all labor and furnishing of all material and equipment necessary to install air handling systems as indicated on drawings and specified herein, including minor items obviously necessary for complete and operating systems.

B. Also included is the work involved to remove & or relocate existing associated equipment, remodeling of existing systems, including connections between new and existing systems.

1.3 SUBMITTALS

A. Shop Drawings: Shop drawings as specified in Section 23 0500 shall include the following:
   1. Paintgrip duct where exposed, EZ Flange with Barrel Clamp on Exposed Spiral
   2. Exposed Spiral Duct
   3. Double Wall Pressure Rated Boiler Venting Systems
   4. Packaged Rooftop Unit with Modulating Natural Gas Heat, Staged DX Cooling, & Powered Exhaust, Single Zone VAV Application (RTU-1)
   5. Packaged Rooftop Units with Staged Natural Gas Heat, Staged DX Cooling, Hot Gas Reheat, & Powered Exhaust, Single Zone VAV Application (RTU-2,6)
   6. Packaged Rooftop Unit with Staged Natural Gas Heat, Staged DX Cooling, & Powered Exhaust, Single Zone VAV Application (RTU-3,4,5,7)
   7. VAV/Reheat Terminals (DDC)
   8. Ductless Split System Air Source Heat Pumps
   9. Power Roof Ventilator Exhaust Fans
   10. Science Fume Hood Exhaust Fan
   11. Science Fume PVC Coated Exhaust Duct
   12. Ceiling Exhaust Fans
   13. Rangehood Exhaust Fans
   14. Intake Hood
   15. Motorized Control Dampers
   16. Fan Coil with DX Cooling & Hot Water Heat
   17. Air Cooled DX Condensing Unit
   18. Slotted Fume Exhaust Hoods
   19. Air Cleaners
   20. Dust Collector
   21. Registers, Grilles, & Diffusers
   22. Smoke Dampers
   23. Fabric Duct with Full Length & Circumference Internal Tensioning & Suspension System
   24. Filter List & Filters – At the end of the project the HVAC contractor to provide an additional set of disposable filters.
   25. Spare Parts

PART 2 - PRODUCTS

2.1 INTERNAL DUCT INSULATION

A. See HVAC Systems Insulation.

B. All internal duct insulation shall be 1/2” as specified duct liner with black fire resistant skin surface. Liner shall have an overall density of 2.0 lbs./cu. ft. Installation shall meet NFPA 90A and 90B fire resistant requirements.

C. Apply the insulation in fabricated pieces sized to the interior duct surfaces with the black coated or denser surface exposed to the air stream. Insulation shall be firmly held in place with B.F. 85-10 or 85-60, C.M.C. 17-477, 1-C 225 fire resistant adhesive covering no less than 100% of the duct surface. Further secure insulation on the top and sides of horizontal ducts and all sides of vertical ducts with Omark or KSM capacitor discharge studs and caps on 15” centers. Secure transverse edges with capacitor discharge studs and caps on 6“ centers.

D. Duct sizes indicated on the drawings are the internal dimensions. Where insulation is applied to the inside of ducts, the metal size of the duct shall be increased to result in internal dimensions equal to that shown on the drawings.

2.2 SHEET METAL WORK – LOW & MEDIUM PRESSURE SYSTEMS

A. See plans and insulation specifications for exposed ducts to be paint grip.

B. Unless otherwise specified, (EF-7 Type I Hood – welded 16 gauge black iron; EF-8 Type II Condensate Hood – Aluminum, EF-15 Science Fume Hood – PVC coated) construct ducts from 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, heavily galvanized.

C. Metal gauges for low and medium pressure duct systems shall be of metal gauges and reinforcing as recommended by SMACNA or as follows:

Max. Dimension of Rect. Ducts or Dia. 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

D. Ductwork shall be constructed, braced, reinforced and sealed as recommended by ASHRAE and SMACNA. 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.

E. Low pressure ductwork with the longest side 36" wide and over, or medium pressure ductwork 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 1-25 and 1-37, of the 1985 SMACNA Manual, First Edition. Ductmate 35/25 may be used for transverse joint construction, 35" wide and smaller. 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 using a continuous metal cleat on top joints of ducts for added weather protection. Slide on systems shall be Ductmate, Ward Industries, Inc., or equal.

F. 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.

G. 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.

H. Where interior duct insulation is required, increase the duct size to maintain the free area shown on the Drawings.

I. 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, power roof ventilators, and louvers. Drip pans to be soldered watertight.

J. 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.

K. Flexible connections shall be installed between suction and discharge openings in fan units and the ducts with which they are connected as shown on the Drawings, 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.

L. 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.

M. 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.

N. 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.

O. All ductwork visible through the face of a register or grille shall be painted with a flat black paint.

P. 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.

Q. Concealed low pressure round ductwork may be rigid spiral ductwork or snaplock type with adjustable elbows.

R. All exposed round ductwork and round ductwork to the inlet of VAV terminals shall be United, Semco, Norlock, Foremost or equal, rigid spiral duct and fittings.

S. All exposed ductwork to be PAINTGRIP and shall be United, Semco, Norlock, Foremost or equal, rigid spiral duct and fittings. Refer to architectural reflected ceiling plans.

T. 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 and shall not be used on return or exhaust ductwork.

2.3 DUCT HANGERS AND SUPPORTS

A. Securely attach all ductwork to the building construction in a manner to be free of vibration and swaying under all conditions of operation. Hanger attachments shall be appropriate for the building structure and shall be subject to the A/E's approval. Hang ducts from beams and joist whenever possible.

B. Ducts shall be substantially supported with hangers located according to SMACNA standards.

2.4 DUCT INSTALLATION

A. Duct sizes shown on the drawings are nominal inside dimensions. Where internal insulation is provided, duct sizes must be increased appropriately to maintain indicated inside dimensions.

B. All ductwork will be run substantially as shown on the plans with bends and curves. Changes in size or cross section shall be made with long tapers. The A/E reserves the right to slightly change the run of certain ducts without extra cost to the Owner, if necessary to avoid unforeseen structural or other interferences.

C. Where ducts run through bar joists or other ceiling spaces and structural, mechanical, or electrical interference is encountered, maintain same cross sectional area as indicated on plans with a maximum of 4-1/2 to 1 aspect ratio.

D. All openings in duct for grilles, registers, etc. shall be capped dust-tight with G.I. Metal caps during the construction period.

E. Round branch duct connections to rectangular mains shall be made with round manual balancing dampers meeting the following specifications: Dampers shall consist of a 20 ga. Galvanized steel; 3/8" square plated steel axles turning in acetal bearings. Damper shall include optional 1-1/2" standoff bracket (with extended pin) to accommodate for the thickness of external duct insulation. Dampers have quadrant operator and shall be suitable for pressures to 1.0" w.g., velocities to 2000 f.p.m. and temperatures to 180 degrees F. Testing and ratings to be in accordance with AMCA Standard 500. Basis of design is Greenheck model MBDR-50.

F. Exhaust/relief air, and air intake ducts shall be equipped with 3" deep watertight pans to collect moisture and condensate. Seal all joints with sealant.

G. All changes in direction shall be made with curved elbows having a centerline radius equal to 1-1/2 times the duct width. Where space conditions prevent the use of curved elbows and/or where square turns are indicated, provide square turn elbows with turning vanes. Vanes may be either commercial type ducturns or equal, or shop fabricated to conform to SMACNA standards. Vanes shall be double thickness type pre-assembled on runners before installing in each elbow. Brace adequately and avoid rough edges to prevent objectionable noise.

2.5 ACCESS PANELS

A. Provide access panels to permit inspection and maintenance of all hot water coils, motorized volume dampers, smoke dampers, control equipment, and other equipment requiring maintenance. Panels shall be located in position dictated by the equipment such that maintenance may be performed. Panels shall not be located in top side of ducts.

B. Panels shall be attached to duct with zinc plated cam latches. 18" x 18" and smaller panels shall have a minimum of two (2) latches. Larger panels shall have a minimum of four (4) latches. Panel shall set in rigid frame with sponge rubber gasketing to prevent air leakage. Where ductwork is insulated, panels shall be of double wall construction with 1" rigid insulation fill.

C. Where duct size permits, access panels shall be a minimum 18" x 16" or 2" smaller than duct size, whichever is smaller.

2.6 CURBS AND FLASHING

A. Curb for roof mounted equipment shall be provided by this contractor, unless otherwise specified and scheduled. This contractor shall also provide counterflashing. The counterflashing shall be galvanized sheet metal, and all joints shall be soldered watertight.

B. Curb on all roof-mounted equipment shall be fully insulated.

C. Curbs on equipment with fresh air intake shall be minimum 18” high.

D. Flashing will be provided under the General Contract.

E. Roofing work to be by the roofing contractor.

F. Coordinate the roof slope with construction manager prior to submitting shop drawings.

2.7 DOUBLE WALL PRESSURE RATED BOILER VENTING SYSTEMS

A. Furnish & install Metal-Fab Inc. Model FCS CORR/Guard II Double Wall pressure rated venting system AL29-4C stainless steel, 1” air gap insulation, aluminized outer, & rain cap termination. Coordinate exact size with boiler provided by others under Boiler Room Heating Equipment Bid Package.

B. Connect breeching to boiler outlet, full size of outlet. The boiler shall operate under positive (Category IV) stack pressure.

2.8 PACKAGED ROOFTOP UNITS WITH STAGED DX COOLING, MODULATING (RTU-7, RTU-8) AND STAGED (RTU-9, RTU-10) NATURAL GAS HEAT, AND POWERED EXHAUST (VAV APPLICATION – RTU-8,10, SINGLE ZONE APPLICATION – RTU-7,9)

A. HVAC Equipment Insulation
   1. Evaporator fan compartment:
      a. Interior cabinet surfaces shall be insulated with a minimum 2 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.24 or better. Insulation shall be installed between interior (galvanized) and exterior (painted) steel surfaces. Construction of outer cabinet shall be double walled.
      b. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
   2. Economizer and Control compartment:
      a. Interior cabinet surfaces shall be insulated with a minimum 2 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.24 or better, adhered with acrylate polymer-based adhesive. Insulation shall be installed between interior (galvanized) and exterior (painted) steel surfaces. Construction of outer cabinet shall be double walled.
      b. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
   3. Partition, Base Pan, and Duct Panel:
      a. Interior cabinet surfaces shall be insulated with a minimum 1 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.24 or better, adhered with acrylate polymer based adhesive.
      b. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

B. Direct- digital Control system for HVAC
   1. Shall be ASHRAE 62 compliant.
   2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
   3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).
   4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.

5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.
6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space and be Demand Control Ventilation (DCV) ready.
7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 3 minutes standard and adjustable from 2 to 7 minutes.
8. Built in lead-lag compressor sequencing to support balanced utilization of refrigerant circuits
9. Unit shall provide surge protection for the controller through a circuit breaker.
10. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
11. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
12. Shall utilize a USB connection to allow for uploading and downloading of data.
    a. USB shall allow for downloading of “trending data” for analysis of inputs and values on other device such as a PC.
    b. USB shall allow for uploading of new firmware to the UCB.
    c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
13. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
    a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
    b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
    c. Wi-Fi transmitting device can be connected by 3 means.
        1) RJ-12 port connected directly to UCB.
        2) Optional connection port mounted in operating space.
        3) Optional connection to building network allowing unit access from any internet browser worldwide.
14. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
15. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
16. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 1995, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

C. General
1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and gas combustion or nickel chromium elements for heating duty.
2. Factory assembled, single- piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.
3. Unit shall use environmentally sound, R-410A refrigerant.
4. Unit shall be installed in accordance with the manufacturer’s instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

D. Quality Assurance

1. Unit meets ASHRAE 90.1 minimum efficiency requirements.
2. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.
3. Unit shall be designed to conform to ASHRAE 15.
4. Unit shall be UL- tested and certified in accordance with ANSI Z21.47 -2016/CSA 2.3-2016, and CSA C22.2 No. 60335-2-40.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
7. Roof curb shall be designed to conform to NRCA Standards.
8. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
9. Unit shall be designed in accordance with CSA C.22.2 NO.60335, including tested to withstand rain.
10. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box.
11. Unit shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.

E. Delivery, Storage, and Handling

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
3. Unit shall only be stored or positioned in the upright position.

F. Operating Characteristics

1. Unit shall be capable of starting and running at 115°F (46°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ±10% voltage.(RTU-7,RTU-8)
2. Unit shall be capable of starting and running at 125 ºF outdoor temperature, exceeding maximum load criteria of AHRI Standard 340/360. The compressor, with standard controls, shall be capable of operation down to 0 ºF outdoor temperature. Unit shall be provided with fan time delay to prevent cold air delivery before heat exchanger warms up. (RTU-9, RTU-10)
3. Compressor with standard controls shall be capable of operation down to 45°F (7°C), ambient outdoor temperatures. Intermittent cooling shall be operational down 0° F (-17° C). Low ambient kit is necessary if mechanically cooling at ambient temperatures below 40°F (4°C). (RTU-7, RTU-8)
4. Unit shall be factory configured for vertical supply & return configurations.

G. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/-5, Hardness: H- 2H Pencil hardness.
3. Unit cabinet shall have gas and electric utility knockouts in the side of the unit and in the unit underside.
4. Base Rail
    a. Unit shall have base rails on a minimum of 4 sides.
    b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
    c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
    d. Base rail shall be a minimum of 12 gauge thickness.
5. Condensate pan and connections:
    a. Shall be an internally sloped condensate drain pan made of a non- corrosive material.
    b. Shall comply with ASHRAE Standard 62.

c. Shall use a 1” NPT female drain connection through the side of the drain pan. Connection shall be made per manufacturer’s recommendations.

6. Top panel:

a. Shall be a multi piece top panel.

Gas Connections

All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit.

Through-the-base capability.

Standard unit shall have a through-the-base gas-line location using a raised, embossed portion of the unit base-pan.

Optional, factory approved, water- tight connection method must be used for through-the- base gas connections.

No base-pan penetration, other than those authorized by the manufacturer, is permitted.

Electrical Connections

All unit power wiring shall enter unit cabinet at a factory prepared opening or knockout location.

Through-the-base capability.

Standard unit shall have a through-the-base electrical location(s) using a raised, embossed portion of the unit base-pan.

Optional, factory approved, water- tight connection method must be used for through-the- base electrical connections.

No base-pan penetration, other than those authorized by the manufacturer, is permitted.

H. Gas Heat

Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.

Shall incorporate a direct- spark ignition system and redundant main gas valve.

Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.

(RTU-9, RTU-10) Staged heat units shall have two stages of heating capacity with first stage capacity 60% of total capacity.

(RTU-7, RTU-8) Modulating Gas Heat:

For applications requiring gas heat for morning warm-up, supply air (SA) tempering, or other heating needs, a modulating natural gas furnace is available for finer temperature control. The furnace is located downstream of the supply fan. The SAT (supply temperature sensor) is located across the face of the supply duct opening in the unit. Ignition and safety controls shall be included and factory wired.

I. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.

IGC board shall notify users of fault using an LED (light- emitting diode).

The LED shall be visible without removing the control box access panel.

Unit Control Board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.

Unit shall be equipped with anti- cycle protection with one cycle on unit flame rollout switch or 3 short cycles on the high temperature limit switch. Fault indication shall be made using an LED.

J. Stainless Steel Heat Exchanger construction

Use energy saving, direct- spark ignition system.

Use a redundant main gas valve.

Burners shall be of the in- shot type constructed of aluminum- coated steel.

All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).

The stainless steel heat exchanger shall be of the tubular- section type, constructed of a minimum of 20- gauge type 409 stainless steel.

Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.

K. Induced draft combustion motor and blower

Shall be a direct- drive, single inlet, forward- curved centrifugal type.
Shall be made from steel with a corrosion- resistant finish.
Shall have permanently lubricated sealed bearings.
Shall have inherent thermal overload protection.
Shall have an automatic reset feature.

L. Coils

Evaporator Coils, Aluminum Fin - Copper Tube:

Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

Shall be leak tested to 150 psig, pressure tested to 250 psig, and qualified to CSA C22.2 No. 236-11(UL 1995) 4th edition burst test at 1775 psig.th edition burst test at 1775 psig.

Assembled unit shall be pressure tested to 450 psig.

Condenser Coils, All Aluminum Microchannel:

Condenser coils shall have all aluminum microchannel design consisting of aluminum multiport flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.

Microchannel condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

Assembled unit shall be pressure tested to 450 psig.

M. Refrigerant Circuits

(RTU-7, RTU-8) 4 speed IntelliSpeed and Variable Air Volume airflow options shall have 2 independent refrigerant circuits with 4 stages of cooling.

(RTU-9, RTU-10) The unit shall have 2 independent refrigerant circuits with 3 stages of cooling.

(RTU-9, RTU-10) The unit shall have two independent refrigerant circuits, equally split in 50% capacity increments.

(RTU-9, RTU-10) The unit shall be equipped with hot gas bypass in the refrigerant circuit.

Refrigerant circuit shall include the following control, safety, and maintenance features:

Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.

Refrigerant filter drier - Solid core design.

Service gauge connections on suction and discharge lines.

N. Compressors

Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.

(RTU-7, RTU-8) Four stage models shall use a tandem compressor set on circuit one and a fixed speed compressor on circuit two.

(RTU-9, RTU-10) Three stage models shall use one compressor on each circuit and use hot gas bypass for modulation.

Compressor motors shall be cooled by refrigerant gas passing through motor windings.

Compressors shall be internally protected from high discharge temperature conditions.

Compressors shall be protected from an over- temperature and over- amperage conditions by an internal, motor overload device.

Compressor shall be factory mounted on rubber grommets.

Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

Crankcase heaters shall be installed in the factory on compressors.

O. Filter Section

1. Filters access is specified in the unit cabinet section of this specification.

P. Evaporator Fan and Motor

1. Evaporator fan motor:
   a. Shall have permanently lubricated ball-bearings.

b. Shall have inherent automatic- reset thermal overload protection.
c. The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.

2. Evaporator Fan:
a. Fan shall be a belt drive assembly with an adjustable pitch motor pulley.
b. Shall use sealed, permanently lubricated ball-bearing type.
c. Shall use dual blower design consisting of two balanced blower fans on a single shaft.
d. Blower fan shall be double- inlet type with forward- curved blades.
e. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

Q. Condenser Fans and Motors

1. Condenser fan motors:
a. Shall be a totally enclosed motor.
b. Shall use permanently lubricated ball-bearings.
c. Shall have inherent thermal overload protection with an automatic reset feature.
d. Shall use a shaft- down design.

2. Condenser Fans:
a. Shall be a direct- driven propeller type fan.

R. Special Features Options and Accessories

1. Variable Frequency Drive (VFD). Available on multi-speed (IntelliSpeed) and VAV indoor fan motor options:
a. Shall be installed inside the unit cabinet, mounted, wired and tested.
b. Shall contain Electromagnetic Interference (EMI) frequency protection.
c. Insulated Gate Bi- Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform.
d. Built in LED display and controls. Does not require additional kit or options.
e. RS485 capability standard.
f. Electronic thermal overload protection.
g. 5% swinging chokes for harmonic reduction and improved power factor.
h. All printed circuit boards shall be conformal coated.

2. Low Leak Economizer:
a. Integrated, linkage driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
b. Damper blades shall be galvanized steel with metal gears. Plastic or composite blades on intake or return shall not be acceptable.
c. Damper blades shall be class 1A dampers.
d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
f. Economizer shall comply with, and be certified to, the AMCA 511 standard.
g. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft2 leakage at 1 in. wg pressure differential.
h. Economizer controller shall be the Johnson Controls SE Economizer Controller
1) On- board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
2) Display alarms if the following occur
a) Economizer is economizing when conditions do not support
b) Economizer is not economizing when conditions do support
c) Damper Stuck
d) Excess Outdoor Air
e) Failed Sensor
3) Automatic sensor detection

4) Capabilities for use with multiple-speed indoor fan systems
5) Utilize digital sensors: Dry bulb and Enthalpy
6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47

i. Shall be capable of introducing up to 100% outdoor air.
j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
k. Shall be designed to close damper(s) during loss- of- power situations with spring return built into motor.
l. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is available as a factory or field installed sensing option. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
o. Dampers shall be completely closed when the unit is in the unoccupied mode.
p. Economizer controller shall accept a 2- 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
q. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
r. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.

S. Phase Monitor:
1. Shall provide protection against phase reversal, phase loss, and phase unbalance.
2. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
3. Shall have visual LED indication of operational status.

T. Hinged and tool less access panels:
1. Cabinet panels shall be hinged.
2. Shall provide easy access with toolless latching mechanism.
3. Shall be on major panels of: filter, control box, fan motor, and gas or electric heat controls.

U. Flue Exhaust Kit:
1. Flue exhaust shall provide redirection of flue products above the top of the unit prevent mixing with fresh air intake and combustion air supply.
2. Flue exhaust kit shall direct unit exhaust vertically instead of horizontally.

V. Louvered Hail/Coil Guard:
1. Shall cover all external sides of unit condenser coil to prevent damage or tampering.
2. Field kit shall contain all materials necessary to field install a coil guard.
3. Shall provide protection for the coil and header on the entire exposed surfaces of the outdoor coil.

W. Unit-Mounted Circuit Breaker:
1. Breaker shall be factory installed, internally mounted.
2. National Electric Code (NEC) and UL approved circuit breaker shall provide unit power shutoff and protect the unit in the event of a short-circuit or overload condition.
3. Shall be accessible from outside the unit.
4. Shall provide local shutdown and lockout capability.

X. Powered Convenience Outlet:
1. Outlet shall be powered from main line power to the rooftop unit.

2. Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
3. Outlet shall include 15 amp GFI receptacles with independent fuse protection.
4. Voltage required to operate convenience outlet shall be provided by a factory installed step-down transformer.
5. Outlet shall be accessible from outside the unit.

Y. Modulating Power Exhaust:

1. Power exhaust shall be used in conjunction with an integrated economizer.
2. Exhaust fans shall be of centrifugal blower design with dual exhaust fans.
3. Exhaust shall achieve modulation of airflow from the use of a Variable Frequency Drive in conjunction with monitoring the static pressure in the building duct.
4. Shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0- 100% adjustable set point on the economizer control.
5. Exhaust shall have built in fold out rain hood design to reduce installation time.

Z. Single Enthalpy Sensor:

1. The single enthalpy sensor option or kit shall provide a relative humidity sensor to be mounted in the outdoor air stream to provide single enthalpy economizer control.
2. The sensor allows the unit to determine if outside air is suitable for free cooling.

AA. Condensate Overflow Switch:

1. Shall utilize float switch to monitor water level in condensate drain pan and signal if water level rises above acceptable threshold.
2. Switch shall detect a 0.25 inch rise above mounted location to determine need to send shutoff signal.
3. Shall send 24V signal to unit controller when tripped to shut down cooling operation and prevent additional buildup of water in condensate drain pan.

BB. Roof Curbs (Vertical):

1. Partial perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
2. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
3. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
4. In Canada this kit is certified for installations from 2000-4500 ft. (610-1372m).
5. Minimum 18” high.

CC. Provide and install options and accessories as described in schedule.

DD. Provide each unit with one additional set of disposable filters for Owner’s use.

2.9 SHUTOFF VAV/REHEAT TERMINALS

A. GENERAL

1. Furnish and install single duct, variable volume air distribution assemblies with hydronic reheat of the type, size, and performance shall be as tabulated in the schedule and on the drawings.
2. The assemblies shall be pressure independent and shall reset to any air flow between zero and the maximum cataloged air volume. At an inlet velocity of 2,000 fpm, the differential static pressure for any unit with attenuator section, sizes 4 through 16, shall not exceed 0.11" w.g.
3. Sound ratings of air distribution assemblies, shall not exceed 25 NC.
4. Performance shall be ARI Certified.
5. The air flow sensor shall be of a cross configuration located at the inlet of the assembly. The sensor shall have twelve total pressure sensing ports and a center averaging chamber designed to accurately average the flow across the inlet of the assembly. Sensor shall provide accuracy within 5% with a 90° sheet metal elbow directly at the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.

6. The assembly casing shall be constructed of 22 gauge zinc coated steel, internally lined with 1/2 inch thick, dual density fiberglass insulation which complies with UL-181 and NFPA-90A. Any cut edges of fiberglass exposed to the airstream shall be coated with NFPA-90A approved sealant.
7. The primary air valve damper shall be heavy gauge metal, with peripheral gasket, pivoted in self-lubricating bearings. In the full closed position, air leakage past the closed damper shall not exceed 2% of the nominal catalog rating at 3" inlet static pressure, as rated by ARI Standard 880.

B. CONTROLS
1. The terminal unit controller shall be a dedicated, microprocessor-based, pressure independent VAV controller complete with electronic flow transducer. The controller shall be capable of stand-alone operation and have the ability to network with a building automation system, personal computer or portable operator interface device.
2. The electric actuator shall be 24 VAC bi-directional, direct coupled to the damper shaft. The actuator must be capable of operating in the stalled position without overheating or mechanical damage.
3. The terminal unit manufacturer shall provide a flow cross or two (2) pipe sensor suitable for interfacing with a differential pressure sensor.
4. The temperature control contractor shall furnish the terminal equipment controller, flow transducer, and electric actuator for installation on each terminal unit by the terminal unit manufacturer. The cost of factory mounting, wiring, enclosure to meet local code and any factory testing and programming of the terminal equipment controller shall be included by the terminal manufacturer.
5. All components shall be calibrated and pretested to ensure a fully functional unit.
6. The zone sensor shall be furnished by the Temperature Control Contractor and shall include temperature setpoint adjustment and access for connection of a hand-held operator terminal or portable computer.
7. The DDC control package shall be calibrated and factory set for the maximum and minimum flow rates as scheduled on the drawings.
8. The air terminal unit shall be designed, installed and field adjusted, if necessary, to maintain controlled pressure independent air flow.
9. All control components shall be mounted inside a protective metal enclosure.

C. WATER REHEAT COILS
1. Provide factory mounted hot water reheat coils as scheduled.
2. The coils shall be aluminum plate fin with copper tubes and sweat connections. Coil connections can be right hand or left hand and shall be coordinated with heating contractor. Control valves, automatic air vents and drain vents, shall be supplied and field installed by others.

D. Provide & install accessories as scheduled on the plans.

2.10 DUCTLESS SPLIT SYSTEM AIR SOURCE HEAT PUMPS

A. Furnish and install a ductless split system where shown on plans or as described in schedules.

B. The refrigeration system shall be split consisting of an evaporator section and remote air cooled condensing unit. The evaporator and remote air cooled condensing unit shall be factory assembled and tested.

C. Provide & install powder coated wall mount bracket for outdoor unit.

D. Provide & install hardwired thermostat. Wireless remote thermostat will not be acceptable. See Execution section for installation of thermostats. Contractor shall provide clear lockable covers for any thermostats the Owner desires, coordinate with Owner.

E. Provide and install options and accessories as described in schedule.

F. Provide each unit with one additional set of replaceable filters for Owner’s use.

2.11 POWER ROOF VENTILATOR EXHAUST FANS

A. Furnish and install power roof ventilator where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings. Provide & install accessories as scheduled on the plans.

B. Spun aluminum exhaust fans shall be belt or direct drive type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure.

C. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Drive frame assembly shall be constructed of heavy gauge steel. Motors and drives shall be constructed of heavy gauge steel. Motors and drives shall be mounted on vibration isolators, out of the air stream. Fresh air for motor cooling shall be drawn into the motor compartment through a large space between the fan shroud and the motor cover. Motors and drives shall be readily accessible for maintenance.

D. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the cast type, keyed and securely attached to the wheel and motor shafts.

E. Motor pulleys shall be adjustable for final system balancing. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment. A conduit chase shall be provided through the base to the motor compartment for ease of electrical wiring.

F. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number for future identification.

G. Provide and install options and accessories as described in schedule.

H. All power roof ventilator exhaust fan drops to have fully insulated field installed 3" deep watertight drip pan.

2.12 SCIENCE FUME HOOD EXHAUST FAN & PVC COATED EXHAUST AIR DUCTWORK

A. Belt - Driven, Inline Centrifugal Fume Exhaust Fans: Inline Centrifugal fan units, configured for roof - mounting, for vertical flow of relatively clean air containing laboratory fumes or hazardous vapors for Heating, Ventilating, and Air-Conditioning (HVAC) applications.
   1. Basis of Design Product: Aerovent, Model AFE, Belt Driven, Inline Centrifugal Axial Fans.
   2. Permanently attach nameplate displaying serial number and unit information.
   3. Fan assemblies: Provide unit suitable for maintaining structural integrity and operation in 125 mile per hour (55.9 meter/second) wind without external guy - wires or supplemental supports when mounted on manufacturer-supplied roof curbs.

B. Fan Capacities and Characteristics: Refer to Drawing schedule.

C. Fan Wheel Impeller: Centrifugal design with formed steel backward inclined blades continuously welded to wheel backplate and wheel cone.
   1. Statically and dynamically balance wheel.
   2. Minimum Balance Quality Grade: G6.3, in accordance with AMCA Standard 204.
   3. Include fins on wheel backplate.

D. Spark Resistant Construction: Mount bearings outside flow airstream, and provide sealed metal belt shield tubes.
   1. AMCA Type B: Provide non-ferrous fan wheel impeller and aluminum rub ring where shaft penetrates fan housing.

E. Fan Shaft:
   1. AISI C1045 hot-rolled steel.
   2. Turn, grind, and polish shaft.
   3. Size shaft for first critical speed minimum 1.43 times maximum speed for each fan class.

4. Apply petroleum based rust preventative coating.
5. Key shaft to wheel hub.

F. Provide standard shaft seal to reduce leakage and protect the bearings from contaminated airstreams.

G. Bearings: Manufacturer's standard field-lubricated ball or roller bearings with pillow block mounting, based on fan size, with grease lines extended to outside fan housing.
1. Minimum L-10 Bearing Life: 200,000 hours at maximum operating speed, in accordance with ABMA 9 for Ball Bearings, or ABMA 11 for Roller Bearings.

H. Housing: Steel with continuously welded seams and streamlined inlet. Reinforce housing to prevent vibration. Provide punched inlet flange.

I. Weather Cover: Provide hinged steel weather cover to shield motor and belt-drive from weather. Fabricate with rainproof ventilation slots.

J. Inner Cylinder: Aluminum, rigidly constructed to support fan shaft and bearings, with removable discharge cone.
1. Design fan to allow for servicing fan shaft, bearings, and sheave by removing discharge cone.

K. Sealed Belt Tube: Sealed to protect belts from the airstream.

L. Discharge Nozzle and Windband: Provide combination discharge nozzle and windband to increase discharge velocities to velocities that comply with ANSI Z9.5, minimum 3,000 feet/minute (15.2 meter/second).
1. Design and install windband to provide 120 inch (3,048 mm) minimum discharge height above roof surface.
2. Design discharge nozzle to develop maximum 9,500 feet/minute (48 m/second) discharge air velocity.
3. Provide discharge damper providing 100 percent shutoff preventing rain intrusion while allowing plume to develop when fan is energized.

M. Straightening Vanes: Fabricate from same material as housing. Aerodynamically designed to recover velocity pressure and convert it to static pressure in downstream ductwork.

N. Curb Cap: One-piece, weather-tight construction, pre-punched mounting holes for correct attachment to roof curb and fan inlet flange. Fabricate from [painted] [galvanized] steel.

O. Belt Drives:
1. Drive Components: V-belt drive, rated for minimum 200 percent of motor nameplate horsepower, with machined, cast-iron pulleys, and heat resistant, oil resistant, static-free V-belts.
a. Motor 10 HP and Smaller: Adjustable pitch.
b. Motor 15 HP and Larger: Fixed pitch.

P. Motors: Comply with NEMA MG-1 for designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 section "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Motor Speed: 1,800 rpm.
3. Provide unfused disconnect switch, 3R selected in accordance with Division 26 section "Enclosed Switches."
a. Ship disconnect switch loose for field mounting and wiring.
4. Enclosure Type: [Totally Enclosed Fan Cooled (TEFC)]

Q. Hardware: Provide corrosion resistant stainless steel hardware and fasteners.

R. Coatings:
1. Standard Coating: All carbon steel components shall be cleaned and chemically treated by a phosphatizing process. Fan shall then be coated with gray enamel.

S. Accessories:
1. Inlet Safety Screen: Welded wire safety screens fabricated for easy installation and removal.
2. Stack Section: Tube extension mounted between the outlet of the fan and the nozzle to create an overall fan height of 120 inches (305 mm).

3. Roof Curb: Self-Flashing, 18 inches high, unvented, with 1-1/2 inch (38 mm) thick insulation. Fabricate roof curb of galvanized steel with wood nailer.
4. UL/cUL 705 Compliant Assembly: Provide components required for UL/cUL 705 compliance. Affix UL/cUL 705 labeling and nameplate to finished unit.
5. Spark Resistant Construction: Mount bearings outside flow airstream, and provide sealed metal belt shield tubes.
    a. AMCA Type C: Provide construction that will not permit shaft or fan wheel impeller to contact or strike ferrous metal parts.

T. Factory Run Test: Test run assembled fan units prior to shipment at specified operating speed or maximum RPM allowed. Statically and dynamically balance each wheel in accordance with AMCA Standard 204 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Obtain balance readings by electronic equipment in the axial, vertical, and horizontal directions on each set of bearings.

U. Provide & install accessories as scheduled on the plans.

V. Provide & install PVC coated exhaust ductwork from fume hood to fume hood exhaust fan.

2.13 CEILING EXHAUST FANS

A. Furnish and install ceiling exhaust fan where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (CUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

D. Motor shall be open drip proof type with permanently lubricated sealed bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

E. Provide options and accessories as described in Fan Schedule.

2.14 RANGEHOOD EXHAUST FANS (EF-A'S)

A. Hood to be 30" in width and shall be constructed of stainless steel. All exposed edges to be hemmed. Range hood will be convertible between 7" round, 3-1/4" x 10" rectangular (vertical or horizontal), and non-ducted discharges. Hood shall have a washable aluminum filter and covered light. Incandescent light bulb to be 75 watts maximum. Range hood to be controlled with two-speed rocker switch for fan and single rocker switch for light. Air delivery shall be no less than 190 CFM and sound levels no greater than 8.0 Sones. All air and sound ratings shall be certified by HVI. Range Hood shall be U.L. listed.

B. Furnish and install rangehood exhaust fans where shown on the Drawings.

C. Provide and install options and accessories as described in schedule.

2.15 INTAKE HOOD

A. Furnish and install gravity intake hood where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. The shroud shall be constructed of heavy gauge aluminum with a formed edge for additional strength. Covers shall be detachable to gain access to dampers. A windband, standard bird screen and internal members shall be combined to form a rigid support. Unit shall feature one-piece curb to assure weather tightness.

C. Provide & install accessories as scheduled on the plans.

D. This contractor to provide and install minimum 18" tall insulated roof curb, roofing work by roofing contractor.

2.16 MOTORIZED CONTROL DAMPERS

A. Furnish and install, as shown on plans, Ruskin CD-50 low leakage damper OR equal.

B. Dampers to be 24V, provided & ducted by VC, wired by TC.

C. Damper to be normally closed in outside air ducts, normally open in return air ducts.

D. Damper blade shall be of not less than 16 gauge galvanized steel formed for strength and high velocity performance with closed-cell neoprene edging. Damper blades shall not exceed 8 inches in width. Blades shall be secured to ½ inch diameter zinc plated axles by zinc plated bolts and nuts. All blade bearings shall be nylon. Blade side edges shall seal off against spring stainless steel seals. Teflon coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and ensure smooth operation. All blade linkage hardware shall be constructed of corrosion resistant, zinc plated steel and brass. Dampers shall be suitable for operation within the following temperature limits, -40 degrees to 200 degrees F. and have a maximum leakage of 6 cfm per square foot at 4" water gauge.

E. Provide & install accessories as scheduled on the plans, coordinate exact damper and installation with TC.

2.17 FAN COIL WITH DX COOLING & HOT WATER HEAT & AIR COOLED DX CONDENSING UNIT

A. Furnish and install fan coils where shown on the Drawings. Types, sizes, and performance shall be as tabulated in the schedule and on the drawings.

B. Units shall be factory assembled, piped, wired, and tested. Cabinet shall be steel with interior insulation around cooling coil. Lift-out panels shall expose all items requiring access for maintenance. Finish of external casings and cabinets shall be factory painted, manufacturer's standard color. Fan shall be centrifugal, factory balanced, resilient mounted, direct drive. DX cooling with hot water coil. Provide with factory installed mixing box with factory installed dampers and actuators.

C. 2" MERV 8 filters. Provide with one additional set of filters for Owner's use.

D. Provide with factory installed non-fused disconnect switch with door interlock.

E. Furnish & install where indicated and as scheduled on the plans, a complete factory assembled, high efficiency outdoor air-cooled condensing unit. The units shall be precharged with sufficient refrigerant for operation with evaporator coil and refrigerant tubing and be equipped with refrigerant line fittings which permit soldered or flare connections. Unit shall include brass service valves with fitting and gauge ports located on the exterior of the cabinet.

F. Provide & install accessories as scheduled on the plans.

2.18 SLOTTED FUME EXHAUST HOODS

A. The contractor will field-fabricate the overhead rigid duct in the sizes as shown on the drawings. The rigid duct is mounted in such a way that it is fully supported in an approved manner. All elbows, fittings, and transitions are made according to SMACNA standards. The rigid duct is connected to the exhaust fan or fume collector by means of a flexible connector to minimize noise and vibration.

B. The contractor will install a complete fume exhaust system at the location as shown on the drawings.

C. The exhaust system includes, but is not limited to, slotted fume hoods, rigid overhead duct, and exhaust fan with exhaust stack/vent, or fume collector.

D. Each slotted hood is constructed of formed 18 gauge galvanized steel.

E. The overall dimension of the hood is as indicated on the drawings.

F. All materials and labor required for the complete installation of the system are included in the bid.

G. Provide & install blast gates 10' AFF for balancing purposes.

H. Provide & install accessories as scheduled on the plans.

2.19 AIR CLEANERS

A. Furnish and install air cleaners where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Provide and install options and accessories as described in schedule.

2.20 DUST COLLECTOR

A. Furnish and install a filtered dust collector where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings.

B. Provide and install options and accessories as described in schedule.

2.21 REGISTERS, GRILLES, AND DIFFUSERS

A. Furnish and install registers, grilles, and diffusers where shown on the Drawings. Type, size, and performance shall be as tabulated in the schedule and on the drawings. Provide & install accessories as scheduled on the plans.

B. Provide and install options and accessories as described in schedule.

2.22 FIRE DAMPERS

A. Fire Dampers meeting the following specifications shall be furnished and installed where shown on plans.

B. Fire Dampers:

1. Fire dampers shall meet requirements in accordance with NFPA 80, 90A, and 101. Fire dampers shall be tested, rated and labeled in accordance with UL555. This model carries a 1 1/2 hour UL fire damper rating.
2. Dampers shall be constructed of 2.188 in. galvanized steel frame, galvanized curtain style blades in gauges required by UL listing R13317. Each fire dampers shall be equipped with a factory installed heat responsive device, fusible link, rated to close the damper when temperature at the dampers reaches 165 F. Dampers shall have a minimum UL555 differential pressure rating of 4 in. wg and minimum velocity rating of 2,000 ft/min.

C. Requirements for an approved installation include the following:

1. Openings in wall shall be 1/4" to 1/2" larger than overall size of fire damper and sleeve assembly.
2. Sleeve gauge shall be at least equal to the gage of the duct as defined by the appropriate SMACNA Duct Construction Standard, as described in NFPA90A, when one or more of the following Duct Sleeve Connections are used (Plain S Slip, Hemmed S Slip, Standing S Slip, Reinforced Standing S Slip, Inside Slip Joint, Double S Slip).
3. If any other Duct Sleeve Connections are used, the sleeve shall be a minimum 16 gauge for dampers up to36”W x 24"H and 14 gage if width exceeds 36" or height exceeds 24".
4. Mounting angles shall be minimum of 1-1/2” x 1-1/2” x 14 gauge and bolted, tack welded or screwed to sleeve at max spacing of 12” and with minimum of two connections in each side, top, and bottom. Mounting angles shall overlap wall a minimum of one inch on all four sides.
5. Damper shall be bolted, tack welded or screwed to sleeve on same spacing as angles. Sleeves shall not extend more than 6 inches outside of wall or floor.
6. Provide tight fitting access doors in ductwork at each damper – sized and located so that damper can be readily reset. Service openings shall be identified with stenciled letters no less than ½” in height to indicate the location of the fire protection devices.

2.23 SMOKE DAMPERS

A. General Requirements: Label according to UL 555S by an NRTL.

B. Smoke Detector: Integral, factory wired for single-point connection.

C. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded interlocking, gusseted or mechanically attached corners and mounting flange.

D. Vertical blades are available for special applications.

E. Blades: Roll-formed, horizontal, interlocking, 0.034-inch-thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.039-inch-thick, galvanized sheet steel; length to suit wall or floor application.

I. Damper Motors: two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors as required for the application.
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 15900 "HVAC Instrumentation and Controls."
   3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
   5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
   6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
   7. Electrical Connection: 115 V, single phase, 60 Hz.

K. Smoke dampers shall be by the same manufacturer and shall be smoke tight, and shall be complete with 120V electric actuator. Actuator shall be wired by Division 26.

2.24 FABRIC DUCT WITH FULL LENGTH & CIRCUMFERENCE INTERNAL TENSIONING & SUSPENSION SYSTEM

A. Fabric: Air diffusers shall be constructed of a woven fire-retardant fabric complying with the following physical characteristics:
   1. DuraTex with SkeleCore FTS
   2. Fabric Construction: 100% Fire Retardant Polyester, Coated One Side
   3. Coating: Non-air permeable coating
   4. Weight: 5.5 oz. /yd2 per ASTM D3776
   5. Color: (white, blue, natural, tan, red, green, grey or black) to be selected by the Owner/Architect.
   6. Air Permeability: 0 cfm/ft2 per ASTM D737, Frazier
   7. Temperature Range: 0 degrees F to 180 degrees F.
   8. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the requirements of NFPA 90-A and UL 2518.

B. Textile Systems Fabrication Requirements:
   1. Dispersion orifice sizing, up to 5-inch diameter (design dependent).
   2. Size, quantity, and location of orifices to be specified and approved by manufacturer.
   3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via zip screw fastener – supplied by contractor.
   4. Lengths to include required zippers as specified by manufacturer.
   5. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
   6. Each section of the textile shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.
   7. Fabric system shall include connectors to accommodate suspension system listed below.

8. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90-degree elbows are 5 gores and the radius of the elbow is 1.5 times the diameter of the DuctSox.

C. Design Parameters:
1. Textile air diffusers shall be designed from 0.25" water gage minimum to 3.1" maximum, with 0.5" as the standard.
2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F.
3. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.
4. Do not use fabric diffusers in concealed locations.
5. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.

D. TEXTILE AIR DISPERSION SYSTEM:
1. SkeleCore FTS (Fabric Tensioning System): Air diffusers shall be constructed with internal tensioning frame.
a. System shall cylindrically tension textile along the entire length of textile duct,
1) Tensioning system shall include full 360-degree tensioning and intermediate rings with quick connection spacer tubes concealed inside the fabric system.
2) Interior structure to include multiple mechanically adjustable tension devices. To provide proper textile tensioning, structural and textile system shall be configured in segments of no more than 45 feet.
3) Textile components supported solely by metal cylindrical rings.
4) Each cylindrical ring shall require vertical metal to metal vertical cable safety attachment.
5) Warranty: Manufacturer must provide a 20 year product warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

2.25 THROWAWAY FILTERS

A. Provide one additional set of throwaway filters for the entire system. Furnish and install throwaway type filters for air handling systems and return grilles, 1 or 2-inch thick disposable type, ASHRAE 52.1, U.L. Class 2, 30% Efficient Merv8, filters as manufactured by Flanders Airpure, American Air Filter, Farr, Cambridge, or equal where shown on the Drawings.

B. Provide entire system with one additional set of disposable filters for the owner's use.

2.26 DUCTLESS SPLIT SYSTEMS TEMPERATURE CONTROL WIRING

A. Unless otherwise indicated, install all temperature controls work needed to operate all this sections equipment in strict accordance with the manufacturer's recommendations.

B. Installation: All devices in mechanical rooms shall be panel mounted whenever possible. Wiring to remote mounted devices in mechanical rooms and inaccessible spaces shall be run in conduit. Wiring in accessible ceilings may be run with plenum rated cable providing it is securely fastened to the structural members at 4' intervals. Low voltage control wiring shall be installed in conduit a minimum of 12' above finished floor. In general, all wiring in conjunction with the HVAC systems shall be furnished by this contractor under this section of the specifications in accordance with Division 26 of the specifications.

C. **Room thermostats and remote sensors shall be wall mounted type and shall be mounted to match installation height of adjacent switches/sensors by EC. Coordinate mounting location with EC to locate t-stats/sensors and wall switches. Thermostats and sensors shall not be mounted on outside walls.**

2.27 AUTOMATIC TEMPERATURE CONTROL

A. 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 23 0900, CONTROLS & CONTROL SEQUENCES Temperature Control Contractor and in strict accordance with the manufacturer's recommendations.

2.28 SPARE PARTS

A. Provide all rooftop units with one additional set of disposable filters.

B. Provide all ductless split system with one additional set of washable filters.

C. Provide fan coil unit with one additional set of disposable filters.

END OF SECTION 23 7000

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SECTION 26 0100 - BASIC MATERIAL 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.

1.2 MATERIAL AND WORKMANSHIP

A. All material shall be new, of the quality specified, and shall conform to NFPA, NEMA, UL and ANSI standards in every case where such a standard had been established for the particular type of material.

B. Equipment shall be furnished with an U.L. label. Materials shall be standard products of manufacturer's regularly shall be standard products of manufacturer's regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

C. Installation of materials shall be coordinated with other trades and installed at such time and manner as to not delay or interfere with the work of other trades.

D. All workmanship shall be neat, first class and complete in both effectiveness and appearance and shall be executed by person licensed and skilled in the trade.

E. This contractor shall be held solely responsible for proper size and location of hangers, slots, chases, openings, etc., required for proper installation of his work and shall arrange with the proper contactors for the building in of inserts and leaving chases or openings.

1.3 STANDARDIZATION OF PRODUCT MANUFACTURER

A. Except as noted, all magnetic starters, manual starters and motor control centers shall be manufactured by the same company, all finishes shall be the same color, and all equipment shall fit the space designated. Equipment as manufactured by G.E., Square D, Westinghouse or Allen Bradley will be acceptable providing they comply with the specific condition of the specifications and accompanying drawings.

B. Wirings devices, lighting fixtures, and other items covered under single specifications shall be of the same manufacturer and style whenever practical or where failure to do so is visibly noticeable.

1.4 MATERIAL HANDLING , STORAGE AND PROTECTION

A. This contractor shall make provisions for delivery and safe storage of materials and arrangement for introduction into building of equipment too large to pass through finished or existing openings.

B. During construction, it shall be responsibility of this contractor to protect the surface of equipment and material furnished.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLEANING AND PAINTING

A. Clear away all debris, surplus material, etc., resulting from work operations, leaving the job and the equipment furnished under this contract in a clean condition.

B. Equipment furnished with finished paint coat shall be examined upon job completion for scratches and surface damage. Damaged surfaces shall be touched up to match factory finish.

C. Light fixtures shall be dusted and cleaned prior to final acceptance.

D. CONCRETE EQUIPMENT

E. Switchboards and transformers shall be mounted on 4” concrete pads furnished as noted on drawings. Size pads such that pad extend 2” beyond the perimeter of the equipment installed.

F. Exterior light fixtures shall be on or in concrete bases provided by the electrical contractor and as detailed on drawings.

G. Concrete shall conform to Division 03 of this specification.

3.2 CUTTING AND REPAIRING

A. Cutting, fitting, and repairing which may be required for this work shall be done by craftsmen skilled in their respective trades. When cutting is required it shall be done in such a manner as to not weaken walls, partition, or floors. Concrete and masonry shall be cut with a diamond core drill or concrete saw. When patching is required, it shall be done and finished to match existing. All existing walls shall be cut and patched to install new boxes and conduit for the new construction work.

3.3 PENETRATIONS

A. Sleeves shall be used to accommodate conduits, cables or pipes passing thru concrete floors, walls and partitions. Sleeves shall be black iron pipe or galvanized sheet metal set in place and secured in position. Sleeves located above grade shall be caulked with an approved caulking compound to make water tight, fireproof, etc., as required by the particular application. Sleeves located below grade or through on- grade slabs shall be black iron pipe and shall be made watertight with oakum and / or lead wool and sealed with asphalt. For fireproofing, use item equal to 3M product 2000. One hour walls require HWB1003, ULCBJ 1000 and 5000.

B. Conduit passing through poured concrete walls or floors may be imbedded directly into the concrete, however when subject to sheer forces, i.e. below grade applications, the conduit must be rigid steel.

C. Cables and conductors, not in raceway, shall be placed in sleeves when passing through fire and smoke partitions.

D. Sleeves penetrating floors shall extend a minimum of 4” above finished floor.

E. Where acceptable to the Architect/ Engineer and other trades involved, conduit may be placed prior to concrete pour thereby eliminating the use of sleeves. The contractor shall, however, remain responsible to insure and make such installation watertight.

F. Conduit or sleeves going thru the roof shall be installed in pitch pockets complete with flashing as may be required by the type of building construction. Where feeding equipment located on roof, the electrical conduit may be run in the same pitch pocket as used to install piping, etc. to the equipment. It shall be responsibility of the electrical contractor to coordinate sizes of curbs and pitch pockets so as to allow installation of conduit. If conduit cannot be installed in common opening with piping, etc. the electrical contractor shall provide a separate pitch pocket for his wiring.

G. Where conduits, sleeves, wireways, and other electrical raceways pass through fire partitions, walls, or floors, install a fire-stop that provides and effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight, completely fill clearances between raceway and openings as required maintaining the rating of the assembly penetrated.

H. Where conduits, sleeves, wireways, and other electrical raceways pass thru partitions, walls, floors or insulation separating spaces subject to temperature differences, effective means shall be taken to prevent air leaks, and condensation problems.

I. Flexible or liquid tight flexible conduit may not be used through walls, floors, roof, etc. that are moisture, temperature, fire or smoke barriers. Conduits through these types of items must be either rigid steel or EMT.

3.4 MATERIAL INSTALLATION

A. In general, all wiring and electrical items shall be concealed, with visual portions set true and plumb with building lines. Items shall be aligned in an orderly fashion consistent with the patterns and design of the background material.

B. Where items are to be surface mounted, such items shall be grouped together. Provide a ¾” Fire Rated plywood backing, painted two coats grey paint. Leave Fire Rated Identification unpainted.

3.5 TRENCHES, EXCAVATING , AND BACKFILLING

A. The contractor shall do trenching and excavating required installing equipment, underground cable and conduit to the depth shown or required for proper operation. Excavation below the required level shall be backfilled with earth and thoroughly tamped. Contractor shall do all shoring and bracing necessary to perform his work and as required for safety. Contractor shall remove by pumping or other means any water which accumulates in the excavation. Temporary bridges shall be built by the contractor where required to maintain traffic.

B. In any excavation is across hard surfaced streets, drives, or walks, contractor shall cut and replace the surface material. Replacement material shall be identical to material removed unless shown otherwise.

C. If any excavation is across gravel bed or any stabilized yard, contractor shall repair damaged surface. Replacement material shall be identical to existing unless otherwise approved by the Engineer.

D. Contractor shall backfill all excavations made for his work. Utilities services shall be observed by the Engineer or proper inspection authority before backfilling. Backfilling shall be done by placing earth evenly and carefully around conduit in 6” maximum layers. Backfill material shall be free from rock and debris.

E. Each layer shall be carefully, mechanically compacted until at least one foot of cover exists over the pipe or equipment. The remainder of the back fill shall be placed and compacted in one-foot maximum layers. Compaction shall be 90% of the maximum standard Proctor density in area that are to be sodded or seeded Proctor density in areas that are to be sodded or seeded and shall be 95% of maximum modified Proctor density under walks, drives or any structure.

F. The contractor shall be responsible for and shall repair without charge all damage due to settlement of the earth, including but not limited to laws, drives, streets or parking lots, over the damaged area.

G. The contractor shall be responsible for cleaning up areas adjacent to the excavation where the earth has been temporarily stored, sweeping or washing pavement, repairing the gravel surface, or reseeding the lawns as required to bring the entire excavated area as close to the original conditions as possible.

H. All excavated materials not required for fill or backfill shall be disposed or removed from the site by this contractor.

END OF SECTION 26 0100

SECTION 26 0200 - DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes demolition and remodeling work required to facilitate renovation of existing areas as shown on drawings and herein specified.

B. Demolition work as shown on drawings is intended only as a guide. It shall be the responsibility of this Contractor to visit and familiarize himself with the site prior to bidding and thereby determine the amount of demolition required. No extra compensation will be allowed because of the Contractor's misunderstanding as to the amount of work involved or his lack of knowledge of any existing conditions.

PART 2 - EXECUTION

2.1 DEMOLITION

A. Where items are removed, the Contractor shall also remove associated wire and conduit.

B. Except for rough- in material, i.e., wire, conduit, boxes and items indicated for re-use, existing equipment which is removed shall remain the property of the Owner and shall be stored or disposed by the Contractor as directed.

2.2 REMODELING

A. Relocate existing conduits, wires, equipment, devices, fixtures or other equipment as required to adapt existing electrical systems to the new electrical systems.

B. Existing rough- in may be reused if in good condition or as called for on drawings. Conductors, fuses and lamps shall be new.

C. The Contractor shall provide appropriate face plates to cover unused boxes in existing walls. Boxes made inaccessible by new construction shall be removed and necessary conduit extensions and wiring shall be provided as required by the removal of said box.

D. The Contractor shall reconnect circuits unintentionally interrupted by the replacement, removal or relocation of electrical equipment, walls, ceiling, floors, etc.

E. Items indicated as being reused shall be cleaned, stored & installed. Make any repairs indicated.

F. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
G. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
H. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
I. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

2.3 CONTINUITY OF ELECTRIC SERVICE

A. The existing building will be in use during this construction, and this contractor shall schedule and carry out his work in such a manner as to cause the Owner a minimum of inconvenience due to service interruptions. Service interruptions shall be confined to the smallest area possible at any one time and all interruptions shall require a prior approval by the Owner. After service has been restored following an interruption, the electrical contractor shall inspect areas affected by the interruption and be responsible that automatically controlled electrically operated equipment is returned to the same operating condition which existed prior to the interruption.

B. Prior to any power outage lasting longer than 60 minutes, the electrical contractor shall disconnect batteries from all existing battery operated lights. Upon restoration of power, reconnect batteries.

END OF SECTION 26 0200

SECTION 26 0500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, using performance requirements and design criteria indicated.

1. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Raceways:

1. EMT: ANSI C80.3, zinc-coated steel, with setscrew or compression fittings.
2. ENT: NEMA TC 13, complying with UL 1653.
3. FMC: Zinc-coated steel.
4. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
5. LFMC: Zinc-coated, flexible steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
6. RNC: NEMA TC 2, Type EPC-40-PVC, with NEMA TC3 fittings.
7. Raceway Fittings: Specifically designed for raceway type used in Project. EMT fittings shall be steel setscrew type.

B. Wireways: Sheet metal sized and shaped, with screw covers.

C. Surface Raceways:

1. Metal: Galvanized steel with snap-on covers. Prime coating, ready for field painting.
2. Plastic: PVC, extruded and fabricated to size and shape indicated in color selected, with snap-on cover and mechanically coupled connections with plastic fasteners.

2.2 CONDUCTORS AND CABLES

A. Conductors Type THHN-2-THWN-2 comply with NEMA WC70/ICEA s 95-658.

1. Conductors, No. 12 AWG and Smaller: Solid copper.
2. Conductors, Larger Than No. 10 AWG: Stranded copper.
3. Insulation: Thermoplastic, rated at 75 deg C minimum.
4. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

B. Variable-Frequency Controller Output Circuits: Type XHHW-2 in metal conduit.

2.3 GROUNDING MATERIALS

A. Conductors: Solid for No. 8 AWG and smaller, and stranded for No. 6 AWG and larger unless otherwise indicated.

1. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
2. Bare, Solid-Copper Conductors: Comply with ASTM B 3.
3. Bare, Stranded-Copper Conductors: Comply with ASTM B 8.

B. Ground Rods: Copper-clad steel, sectional type; 5/8 by 96 inches (16 by 2400 mm) in diameter.

C. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts with clamp-type pipe connectors sized for pipe.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

E. Provide a code sized, green grounding conductor in each conduit.

2.4 ELECTRICAL IDENTIFICATION MATERIALS

A. Conductor Identification Materials: Color-Coding Conductor Tape: Self-adhesive vinyl tape 1 to 2 inches (25 to 50 mm) wide.

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, polyethylene tape with continuous metallic strip or core.

C. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

E. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1.0-mm) galvanized-steel backing; and with colors, legend, and size required for application.

F. Equipment Identification Labels: Engraved, laminated acrylic or melamine label; punched or drilled for screw mounting. White letters on a dark-gray background; red letters for emergency systems.

G. Fasteners: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.5 SUPPORT AND ANCHORAGE COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.

1. Channel Dimensions: Selected for structural loading.

B. Raceway and Cable Supports: As described in NECA 1.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and fittings.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded malleable-iron body and insulating wedging.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components:

1. Powder-Actuated Fasteners: Threaded-steel stud.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete.
3. Concrete Inserts: Steel or malleable-iron, slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, high strength; complying with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.6 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized-steel sheet.

D. Sleeve Seals: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 GENERAL ELECTRICAL EQUIPMENT INSTALLATION REQUIREMENTS

A. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

B. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.

C. Install electrical equipment to allow right of way for piping and conduit installed at required slope.

D. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.

E. Install required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

F. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Comply with requirements in Division 08 Section "Access Doors and Frames."

G. Install sleeve and sleeve seals of type and number required for sealing electrical service penetrations of exterior walls.

H. Comply with NECA 1.

3.2 RACEWAY AND CABLE INSTALLATION

A. Outdoor Raceways Applications:

1. Exposed or Concealed: IMC.
2. Underground, Single Run: RNC.
3. Connection to Vibrating Equipment: LFMC.
4. Boxes and Enclosures: Metallic, NEMA 250, Type 3R or Type 4.

B. Indoor Raceways Applications:

1. Exposed or Concealed: EMT.

2. Connection to Vibrating Equipment: FMC; in wet or damp locations, use LFMC.
3. Damp or Wet Locations: IMC.
4. Boxes and Enclosures: Metallic, NEMA 250, Type 1, unless otherwise indicated.

C. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

E. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch- (25-mm-) thick concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch (27-mm) trade size, parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

F. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

G. Install pull wires in empty raceways.

H. Connect motors and equipment subject to vibration, noise transmission, or movement with a 72-inch (1830-mm) maximum length of flexible conduit.

I. Install raceways and cables conceal within finished walls, ceilings, and floors unless otherwise indicated.

J. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

3.3 WIRING METHODS

A. Service Entrance and Panel Feeders:

1. Feeders to building shall be type THHN-2/THWN-2 single conductors in raceway.

B. Exposed Feeders, Branch Circuits, and Class 1 Control Circuits, Including in Attic: Type THHN-THWN, single conductors in raceway.

C. Feeders in Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders and Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN-THWN, single conductors in raceway.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application.

F. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

G. Fire Alarm Circuits: Conductors in raceway or cable rated for fire alarm use.

3.4 GROUNDING

A. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

B. Pipe and Equipment Grounding Conductor Terminations: Bolted.

C. Underground Connections: Welded.

D. Install grounding conductors routed along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

E. Install ground rods driven into ground until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

F. Install bonding straps and jumpers in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

G. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

H. Bond to equipment mounted on vibration isolation hangers and supports so vibration is not transmitted to rigidly mounted equipment.

I. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

J. 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.

1. Measure ground resistance not less than two full days after last trace of precipitation and without 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.
2. Perform tests by fall-of-potential method according to IEEE 81.
3. Report measured ground resistances that exceed the following values:

a. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
b. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.5 IDENTIFICATION

A. Power-Circuit Conductor Identification: For No. 3 AWG conductors and larger, at each location where observable, identify phase using color-coding conductor tape.

B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring.

C. Warning Labels for Enclosures for Power and Lighting: Comply with 29 CFR 1910.145; identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

D. Equipment Identification Labels:

1. Labeling Instructions:

a. Indoor Equipment: Adhesive film label with clear protective overlay. Provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Electrical switchgear and switchboards.
c. Motor-control centers.
d. Disconnect switches.
e. Enclosed circuit breakers.
f. Motor starters.
g. Push-button stations.
h. Contactors.
i. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

E. Verify identity of each item before installing identification products.

F. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

G. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

H. Install system identification color banding for raceways and cables at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

I. Color-Coding for Phase Identification, 600 V and Less: Ungrounded service feeder and branch-circuit conductors.

1. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

2. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points.

J. Underground-Line Warning Tape: Continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Fasten hangers and supports securely in place, with provisions for thermal and structural movement. Install with concealed fasteners unless otherwise indicated.

B. Separate dissimilar metals and metal products from contact with wood or cementitious materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

C. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

D. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.

E. Strength of Support and Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated or required by Code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Light Steel: Sheet metal screws.
6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.7 SLEEVE AND SLEEVE-SEALS INSTALLATION

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Cut sleeves to length for mounting flush with both wall surfaces.

C. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

D. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

E. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

F. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

G. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

H. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

I. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in Division 07 Section "Penetration Firestopping."

END OF SECTION 26 0500

SECTION 26 0519 - CONDUCTORS AND CABLES

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 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.

1.3 CONDUCTORS AND CABLES

A. Conductors, cables, and insulation shall conform to NEMA, UL and NEC standards and rules. All conductors and cables shall be new and delivered to the job site in coils or reels, clearly marked with manufacture's name, insulation type, AWG size, and UL listings.

B. Conductor Material: Copper; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

C. Conductor Insulation Types: Type THHN, THHN-THWN and XHHW.

D. Multiconductor Cable: Armored cable, Type AC or Metal-clad cable, Type MC may only be used:

1. Where concealed for branch circuits and used for flex drops to recessed light fixtures and not exceeding 6 feet in length.
2. For end of branch circuit wiring. It shall not be used as a main or homerun of a branch circuit.
3. Where approved in writing by Electrical Engineer.

1.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Use twist on spring compression type such as Ideal Twister series or 3M Scotch-Loc. Push on connectors such as Wago Wall Nuts may only be used inside of light fixtures for ballast connections.

1.5 CONDUCTOR AND INSULATION APPLICATIONS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. VFD Output Circuits (VFC): Type XHHW-2 in metal conduit.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits: Type THHN-THWN or Plenum Rated Fire Alarm Cable, in raceway.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.
L. Class 2 Control Circuits: Type THHN-THWN, in raceway or for thermostats Power-limited cable, concealed in building finishes may be used.

1.6 INSTALLATION
A. Conceal wiring in finished walls, ceilings, and floors, unless otherwise indicated.
B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."
F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."
H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches (16 by 2400 mm).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. CFR 77.701-3, ground wires for circuits having power conductors smaller than No. 6 AWG shall be sized identically to the power conductor. Ground wires for circuits with power conductors No. 6 AWG or larger must be sized to a minimum of half the cross sectional area of the circuit power conductor.

C. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without 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.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 7200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. Flex-Strut Inc.
e. GS Metals Corp.
f. G-Strut.
g. Haydon Corporation.
h. Metal Ties Innovation.
i. Thomas & Betts Corporation, A Member of the ABB Group.
j. Unistrut; an Atkore International company.
k. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti, Inc.
        4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

    1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint with a brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 09 9113 "Exterior Painting" Section 09 9123, "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 0529

SECTION 26 0533 - RACEWAYS AND BOXES

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

C. See Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.2 SUBMITTALS

A. Product Data: For surface raceways, such as Wiremold or Panduit products.

1.3 METAL CONDUIT AND TUBING

A. RMC: Rigid metal conduit shall be galvanized steel with steel fittings (ANSI C80.1).

B. EMT and Fittings: Electrical metallic tubing shall be galvanized steel (ANSI C80.3.)
   1. Fittings Dry Location: Steel set-screw type such as Raco series 2000.
   2. Fittings Wet Location: Steel compression type such as Raco series 2902.

C. FMC: Flexible metal conduit shall be zinc-coated steel, ½" minimum size.
   1. Fittings Dry Location: Steel squeeze type such as Raco series 2100.

D. LFMC: Liquid tight flexible metal conduit with PVC jacket.
   1. Fittings: Steel compression type such as Raco series 3500.

1.4 NONMETALLIC CONDUIT AND TUBING

A. RNC: Rigid Non-Metallic conduit Schedule 40 unless otherwise specified on the plans.
   1. Fittings and conduit bodies: Compatible and of equal wall strength as the conduit.

1.5 METAL UNDERFLOOR BOXES

A. Available Manufacturers:
   1. Steel City – 664-SC
   2. Approved Equal

1.6 SURFACE RACEWAYS

A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
   1. Available Manufacturers:
      a. Hubbell, Inc.; Wiring Device Division.
      b. Lamson & Sessions; Carlon Electrical Products.
      c. Panduit Corp.
      d. Walker Systems, Inc.; Wiremold Company (The).
      e. Wiremold Company (The); Electrical Sales Division.

B. Use Panduit (or equal) type TE-70, with divider wall Te70DW, snap on electrical faceplate T70PG, hanging box TE70DW, device mounting bracket T70DB-X, and sloped snap on data faceplates. Provide all other misc items necessary for a complete system.

1.7 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: Use welded steel metal boxes – min. size 4"x4"x1 ½ ", size as required to meet NEC. Provide appropriate device rings and covers.

B. 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.

C. 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.

1.8 RACEWAY APPLICATION

A. Outdoors:
1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:
1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
a. Damp or Wet Locations: NEMA 250, Type 3R.

C. Minimum Raceway Size: ½" trade size above ground, ¾" below ground or under floor or in poured concrete and minimum size homerun shall not be less than ¾". Minimum Raceway Size for DATA/Communications systems shall be ¾".

1.9 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from nonmetallic conduit to rigid steel conduit before rising above floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
2. 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.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors, in any raceway 1 ½" or larger.

K. Terminations:
1. 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.
2. 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.

L. Flexible Connections: Use maximum of 72 inches 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.

M. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

N. Set floor boxes level and flush with finished floor surface.

O. Set floor boxes level. Trim after installation to fit flush with finished floor surface.

P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

1.10 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.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

F. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    g. Emergency system boxes and enclosures.
    h. Enclosed switches.
    i. Enclosed circuit breakers.
    j. Enclosed controllers.
    k. Variable-speed controllers.
    l. Push-button stations.
    m. Power transfer equipment.

n. Contactors.
o. Remote-controlled switches, dimmer modules, and control devices.
p. Power-generating units.

END OF SECTION 26 0553

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy and outdoor motion sensors.
4. Low Voltage Lighting Relay Panels

B. Related Requirements:

1. Section 26 2726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Products: Subject to compliance with requirements, provide one of the following:

1. Wattstopper.
2. Intermatic, Inc.
3. Tyco Electronics.
4. nLight – Acuity Brand
5. Or approved equal

B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.

2.2 INDOOR OCCUPANCY SENSORS

A. Provide as noted on drawings.

B. Or approved equal

2.3 LIGHTING RELAY PANELS

A. Provide as noted on drawings.

B. Or approved equal

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

C. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

D. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

E. Identify components and power and control wiring according to Section 26 0553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified agent to evaluate lighting control devices and perform tests and inspections.

B. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 0923

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.8 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, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices 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 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:

    a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.

5. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1 where shown.

2.3 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric GE

3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker or Lugs only.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric GE
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric GE
3. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, 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. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I squared x t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 0553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

C. Panelboards will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated

END OF SECTION 26 2416

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Hospital-grade receptacles.
6. Tamper-resistant receptacles.
7. Weather-resistant receptacles.
8. Snap switches and wall-box dimmers.
9. Wall-switch and exterior occupancy sensors.
10. Communications outlets.
11. Pendant cord-connector devices.
12. Cord and plug sets.
13. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

H. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Wiring Devices:
      a. Bryant Electric, Inc./Hubbell Subsidiary.
      b. Eagle Electric Manufacturing Co., Inc.
      c. Hubbell Incorporated; Wiring Device-Kellems.
      d. Leviton Mfg. Company Inc.
      e. Pass & Seymour/Legrand; Wiring Devices Div.
   2. Floor Service Outlets:
      a. Wiremold Company (Walker).
      b. Or equal – Floor service outlets must be compatible with floor duct

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

1.7 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

1.8 RECEPTACLES

A. Straight-Blade-Type Receptacles:
   1. Tamper Resistant: P&S TR20-GRY or equal.
   2. Hospital Grade Heavy-Duty Duplex, Tamper Resistant P&S TR63-HGRY or equal.

B. GFCI Self Testing Receptacles:
   1. Tamper Resistant P&S 2097TR-GRY or equal.
   2. Weather Resistant, Tamper Resistant P&S 2097TRWR-GRY or equal.
   3. Hospital Grade, Tamper-Resistant P&S 2097HGTR-GRY or equal.
   4. Hospital Grade, Tamper-Resistant, Nightlight P&S 2097HGNTLTR-GRY or equal.

1.9 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

1.10 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

1.11 SWITCHES

A. Single Pole Switches: P & S CS20AC1-GRY, 20 A, 120/277-V ac or equal.
B. Three Way Switches: P & S CS20AC3-GRY, 20 A, 120/277-V ac or equal.
C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
2. Fluorescent Lamp and LED Dimmer Switches: Modular; compatible with fixture manufacturer. Capable of consistent dimming with low end not greater than 5 percent of full brightness.

D. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

1.12 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Finished Locations: Type 302 stainless steel, P&S S(X)-N or equal
3. All emergency power devices shall have the faceplate engraved with the panel name and circuit number.

4. Wet Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in "wet locations."
5. Unfinished Surface Mounted Locations: Raised covers such as Raco 800 series.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

1.13 EXTERIOR IN-USE COVER

1. Intermatic WP1010MXD, or equal.

1.14 FLOOR SERVICE FITTINGS

A. Metal Floor Boxes:

Basis of design: Legrand, Walker RFB-4 with in lay cover. Finish and flooring type selected by Architect.

1. Material: Cast metal.

2. Type: Fully adjustable.

3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. At each power location provide and install one 20A 125v duplex receptacle. Configuration 5-20R, gray finish.

C. At each voice and data communication outlet provide and install one Panduit GFG4IW “GFCI” module frame with two RJ45 Cat 6 jacks.

D. Compartments: Barrier separates power from voice and data communication cabling.

E. Service Plate: Round, die-cast aluminum with satin finish.

F. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

G. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

1.15 FINISHES

A. Device Color:

A. Color:

1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70.

2. Wiring Devices Connected to Emergency Power System: Red, unless otherwise indicated or required by NFPA 70.

B. Wall Plate Color: For plastic covers, match device color.

PART 2 - EXECUTION

2.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

2.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

2.3 IDENTIFICATION

A. Comply with Section 26 0553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

2.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 2726

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.1 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers, rated 600 V and less, used for disconnecting and protection functions.

1.2 SUBMITTALS

A. Product Data: For each type of switch and circuit breaker indicated.
B. Shop Drawings: Include wiring diagrams for shunt-tripped circuit breakers.

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.
B. Source Limitations: Obtain switches and circuit breakers through one source from a single manufacturer.
C. Comply with NFPA 70.

1.4 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. General Electric Co.; Electrical Distribution & Control Division.
    2. Siemens Energy & Automation, Inc.
    3. Square D Co.

1.5 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle, interlocked with cover.
B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, and lockable handle, interlocked with cover.

1.6 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 250 A and larger.
    2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
    3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
    4. GFCI Circuit Breakers: Single- and two-pole configurations with 5 -mA trip sensitivity.
B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
    1. Lugs: 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.

1.7 ENCLOSURES

A. Listed for environmental conditions of installed locations, including:
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Food Service Areas: NEMA 250, Type 4X, stainless steel.
   3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

1.8 INSTALLATION

A. Identify components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

1.9 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and circuit breakers and after electrical circuits have been energized, demonstrate product capability and compliance with requirements.
B. Inspections and Tests for Switches and Circuit Breakers: Make internal and external inspections and perform tests, including the following:
   1. Inspect for freedom from physical damage, proper unit rating, mechanical condition, enclosure integrity, cover operation, unit anchorage, clearances, and tightness of electrical connections. If a loose electrical connection is observed on any unit, check each electrical connection for each switch and circuit breaker with a torque wrench for compliance with manufacturer's torquing instructions.
   2. Test cover and other interlocks and interlock release devices for proper operation.
C. Additional Inspections and Tests for Switches: Include the following:
   1. Inspect for proper rating and fuse provisions.
   2. Check adequacy and integrity of fuseholders by removing and installing fuses.
   3. Check integrity of phase barriers.
   4. Inspect blade alignment visually while operating switch to observe adequacy of blade pressure.
D. Additional Inspections and Tests for Circuit Breakers: Include the following:
   1. Inspect for proper frame, trip, and fault current interrupting rating.
   2. Test shunt trip devices, circuits, and actuating components for proper operation.
E. Correct defective and malfunctioning units on-site, where possible, and re-inspect and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 26 2816

SECTION 26 5119 - LED INTERIOR LIGHTING

1.1 SUMMARY

A. Section Includes:
   1. Interior solid-state luminaires that use LED technology.
   2. Lighting fixture supports.

1.2 DEFINITIONS

A. Retain terms that remain after this Section has been edited for a project.
B. CCT: Correlated color temperature.
C. CRI: Color Rendering Index.
D. Fixture: See "Luminaire."
E. IP: International Protection or Ingress Protection Rating.
F. LED: Light-emitting diode.
G. Lumen: Measured output of lamp and luminaire, or both.
H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
B. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
D. Recessed Fixtures: Comply with NEMA LE 4.
E. CRI of minimum 80. CCT of 4000 K.
F. Minimum rated lamp life of 50,000 hours.
G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
H. Internal driver.
I. Nominal Operating Voltage: Universal 120-277v.
J. Housings: Extruded-aluminum housing and heat sink.

2.2 MATERIALS

A. Metal Parts:
   1. Free of burrs and sharp corners and edges.

2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit ordinary maintenance without removing the fixture from the ceiling grid. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.

2.3 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260510 "Basic Electrical Materials and Methods" for channel and angle iron supports and nonmetallic channel and angle supports.
B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches from diagonally opposite fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
C. Adjust aimable fixtures to provide required light intensities.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

END OF SECTION 26 5119

SECTION 27 0536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Ladder cable trays.
2. Wire-basket cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
5. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

6. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

2.2 LADDER CABLE TRAYS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: 9 inches (225 mm) o.c.
3. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
7. Minimum Usable Load Depth: 5 inches (125 mm).
8. Straight Section Lengths: 12 feet (3.6 m) except where shorter lengths are required to facilitate tray assembly.
9. Width: 18 inches (450 mm) unless otherwise indicated on Drawings.
10. Fitting Minimum Radius: 12 inches (300 mm).
11. Splicing Assemblies: Bolted type using serrated flange locknuts.
12. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
13. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.3 WIRE-BASKET CABLE TRAYS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Description:

1. Configuration: Wires are formed into a standard 2-by-4-inch (50-by-100-mm) wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
2. Materials: High-strength-steel longitudinal wires with no bends.
3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
4. Sizes:

    a. Straight sections shall be furnished in standard 118-inch (3000-mm) lengths.
    b. Wire-Basket Depth: 6-inch (150-mm) usable loading depth by 12 inches (300 mm) wide.

5. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
6. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
7. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
8. Splices and Connectors: Protect cables from edges of center rail and do not intrude into cable fill area.

2.4 MATERIALS AND FINISHES

A. Steel:

1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33.
2. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.

4. Finish: Electrogalvanized before fabrication.

    a. Standard: Comply with ASTM B 633.
    b. Hardware: Galvanized, ASTM B 633.

B. Aluminum:

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32 or Alloy 6061-T6 according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: Chromium-zinc-plated steel, ASTM F 1136.
3. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

A. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

B. Comply with requirements for fasteners in Section 26 0553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

B. Remove burrs and sharp edges from cable trays.

C. Fasten cable tray supports to building structure.

D. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg). Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."

E. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

F. Support bus assembly to prevent twisting from eccentric loading.

G. Support wire-basket cable trays with center support hangers.

H. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

I. Make cable tray connections using manufacturer's recommended fittings.

J. Install cable trays with enough workspace to permit access for installing cables.

K. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 27 0526 "Grounding and Bonding for Communications Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.

9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that

END OF SECTION 27 0536

SECTION 27 1500 - VOICE AND DATA COMMUNICATION CABLING

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.

1.3 SCOPE OF WORK

A. The contractor shall provide and install all boxes, conduit, cable tray and cables (data, phone and TV). The contractor shall provide and install all field termination devices, faceplates, patch panels and floor mounted data racks.

1.4 DEFINITIONS

A. EMI: Electromagnetic interference.
B. IDC: Insulation displacement connector.
C. LAN: Local area network.
D. PVC: Polyvinyl chloride.
E. STP: Shielded twisted pair.
F. UTP: Unshielded twisted pair.

1.5 SUBMITTALS

A. Product Data: Include data on features, ratings, and performance for each component specified.
B. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.
C. Qualification Data: For Installer submit BICSI registration and Manufacturer's Certified Installer documentation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: System installer must be certified by the manufacturer in the installation of the products used and has a ***minimum of a BICSI registration at the Installer level.***
B. Source Limitations: Obtain all products except twisted-pair cables 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.

1.7 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with Owner's Director of Technology.
    1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
    2. Record agreements reached in meetings and distribute to other participants.
    3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

1.8 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cable:
   a. General Cable Genspeed 6000 Enhanced, CMP rated, Manufacturers part # 7131940. For all data openings and cameras.
   b. General Cable Genspeed 10 UTP Category 6A, CMP rated, Manufacturers part # 7141823. For all WAP locations.
   c. Or **pre-approved** equal.
2. Fiber Optic Cable
   a. Corning Cable Systems MIC Interlocking Armored Plenum Cable – 006E88-31131-A3 (six strand single mode).
   b. Berk Tech 6 Strand 50 micron fiber with plenum rated amour shield M-5-IPJ-6-DN-LE-AQ-BER
   c. Berk Tech 12 Strand 50 micron fiber with plenum rated amour shield M-5-IPJ-12-DN-LE-AQ-BER
3. Terminal and Connector Components and Distribution Racks:
   a. Panduit
   b. Or **pre-approved** equal.

1.9 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, provide spare conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 20 percent future increase in active workstations.

1.10 MOUNTING ELEMENTS

A. Raceways and Boxes: Comply with Division 26 Section "Raceways and Boxes."

B. Backboards: 3/4-inch, interior-grade, fire-retardant-treated plywood.

1.11 TWISTED-PAIR CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

A. Cables: Listed as complying with Category 6 TIA/EIA-568-B.

B. Conductors: Solid copper.

C. UTP Cable: Comply with TIA/EIA-568-B. Four, thermoplastic-insulated, individually twisted pairs of conductors; No. 24 AWG, color-coded; plenum rated jacket. General Cable Corporation. Genspeed 6000 Enhanced (Blue color jacket).

D. UTP Cable Connecting Hardware: Comply with TIA/EIA-568-B. IDC type, using modules designed for punch-down caps or tools.

1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
2. IDC Connecting Hardware: Consistent throughout Project.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable or two-pair STP cable indicated.
2. Mounting: Rack.
3. See detail on electrical plans.

F. Jacks and Jack Assemblies for UTP Cable: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals.
   1. Panduit CJ688TP – Color as shown on the plan detail.

G. Workstation Outlets: Multiple jack-connector assemblies mounted in single or multigang faceplate, match cable openings as shown on the plans.
   1. Faceplate with Labels: Panduit CFPL-x- IG, verify color at time of shop drawings.
   2. Mounting: Flush, unless otherwise indicated.

H. Data Racks:
   1. Floor mounted two post Panduit R2P with vertical cable management on both sides use front and rear access Panduit PRV8 with PRD covers. Vertical management may be shared when mounted between racks.
   2. Floor mounted four post racks Panduit R4P with vertical cable management on both sides use front and rear access Panduit PRV6 with PRD covers.
   3. Install one horizontal cable management system between each patch panel, use Panduit WMP1E.

I. Patch Panels: All patch panels in IDF and rack mounted panels in MDF shall be Panduit CPPL48BLY Patch Panels, designed to fit within standard 19” equipment racks. Panels shall contain the quantity of RJ45 modular connectors as identified in the drawings or specifications. Any blank or spare ports shall be filled with CMBBL-X inserts. Provide enough patch panel space to terminate all of the cables plus 20% spares.

J. Fiber optic closet connector housing, use Panduit fiber enclosure FRME1U in IDF locations and FRMEZU in MDF location and Panduit FAP6WAQSCZ L/C fiber bulkheads.

1.12 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.

1.13 EXAMINATION

A. Examine pathway elements intended for cables. 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.

1.14 APPLICATION OF MEDIA

A. Horizontal Cable for Data Service: Use UTP Category 6 plenum rated cable for runs between wiring closets and workstation outlets.

B. Horizontal Cable for Voice Service: Use UTP Category 6 plenum rated cable for runs between wiring closets and workstation outlets.

C. Terminate the 50 pair phone cable to telco 110 style patch panels in rack, use Leviton 49013-48 and Leviton 49013-24 or equal.

1.15 INSTALLATION

A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. J-Hooks shall be installed with adequate support brackets as required per the drawings and standards. J-hooks shall be supported using commercially available components designed for the purpose of the existing building structure, and appropriate

mounting application. J-Hooks shall not be supported from fixtures originally placed to support other equipment. Cabling contractor shall utilize the appropriate quantity of J- hooks and spaced as recommended by TIA/EIA industry standards. Use UL-listed plenum cable throughout. Conceal raceway and cables except in unfinished spaces. No single J-Hook shall contain more than 40 Cat 6 cables.

B. Install cables 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.
   1. Cable raceways shall not be filled greater than the NEC maximum fill for the particular raceway type and in no case greater than 40%. Minimum Raceway shall be ¾" trade size.
   2. Cables shall be installed in continuous lengths from origin to destination (no splices) unless specifically addressed in the document. Maximum cable lengths will not be exceeded per industry standards.
   3. Where cable transition points are allowed, they shall be in accessible locations and housed in an enclosure intended and suitable for the purpose.
   4. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
   5. If a J-hook system is used to support cable bundles all horizontal cables shall be supported at a maximum of five-foot intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
   6. Horizontal distribution cables shall be bundled in groups of not greater than 40 cables. Cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle.
   7. Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware. The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
   8. Cables shall not be attached to ceiling grid or lighting support wires. Where light support for drop cable legs are required, the contractor shall install clips to support the cabling.
   9. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
   10. Cables shall be identified by a self-adhesive label in accordance with, ANSI/TIA/EIA-606A "Administration Standard for Telecommunications Infrastructure of Commercial Buildings". The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
   11. Unshielded twisted pair cable shall be installed so that there are no bends less than four times the cables outside diameter (4 X cable O.D.) at any point in the run.
   12. Pulling tension on 4-pair UTP cables shall not exceed 25-pounds for a single cable or cable bundle.
   13. Use of Panduit TAK-TAPE TTS-20R0 in the MDF, IDF and computer room (data center) is required. No nylon cable ties shall be allowed. In all plenum applications, Panduit HLSP or HLTP Tak-Ty cable ties shall be used.
   14. Maximum cable lengths shall not be exceeded.
   15. All horizontal runs, moves, adds, and changes must be documented. Permanent Link test results must be provided.
   16. All penetrations through fire rated building structures (walls and floors) shall have a metal stuffing pipe that extends 12" beyond each side of the building structure and sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetrations) and membrane penetrations (through one side of a hollow fire structure). Any penetrating items i.e. riser slots and sleeves, cables, conduit, cable tray and raceways, etc. shall be firestopped.

C. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible. Exposed cables are only permitted in non-public spaces such as the rooms used for the data racks
D. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. 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.
E. Separation of Wires: Comply with TIA/EIA-569-B rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.
F. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
G. Use splice and tap connectors compatible with media types.

1.16 GROUNDING
A. Comply with Division 26 Section "Grounding and Bonding."
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. Bond shields and drain conductors to ground at only one point in each circuit.
D. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
E. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.
F. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

1.17 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS
A. Mount patch panels, terminal strips, and other connecting hardware on floor-mounted racks, unless otherwise indicated.
B. Group connecting hardware for cables into separate logical fields.
C. Use patch panels to terminate cables entering the space, unless otherwise indicated.

1.18 INSTALLATION STANDARDS
A. Comply with requirements in TIA/EIA-568-B and TIA/EIA-569-B.

1.19 IDENTIFICATION
A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Basic Electrical Materials and Methods" and TIA/EIA-606.
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 same designation. Use logical and systematic designations for facility's architectural arrangement.
C. Workstation: Label cables within outlet boxes.
D. Distribution Racks and Frames: Label each unit and field within that unit.
E. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
F. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
G. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid

frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.

1.20 QUALITY ASSURANCE AND WARRANTIES

A. At the completion of the project all data cable shall be tested by standard test methods such as with a Fluke DTX 1800 tester, the contractor shall be responsible to replace any cables and terminations that do not meet Cat 6 TIA/EIA-568-B and TIA/EIA-569-B test standards.

END OF SECTION 27 1500

SECTION 27 5123 – SCHOOL PAGING AND INTERCOM

PART 1 - GENERAL

1.1 SCOPE

A. There is an existing Intercom System that is being extended and re-used. The system is rack mounted in a cabinet near the high school admin office. System head-end shall remain and its functions extended to new addition. The specification below shall apply to speakers and other accessories that must be added to the system. See drawings for location of system being relocated and new intercom speakers and accessories.

B. This Section includes all labor, materials, tools, equipment, and related services to furnish and install a School Paging/ Intercom as shown on the drawings and specified herein.

C. This Contractor shall furnish, install, and place into operation a complete and operating system, as specified herein. This system shall include, but not be limited to a Main Intercom System Controller with amplifier, operator's consoles, room speakers, call-in switches, conduits, cables and wire necessary to form a complete system, and including interface to the administrative phone system.

D. Related Sections include the following:
   1. Wireless GPS Clock System, Section 27 5313

1.2 QUALITY ASSURANCE:

A. Product Quality
   1. Equipment described in this Section shall be provided & installed by a company regularly engaged in the design, sale and installation of School Page/ Intercom and Program Clock Systems. This company shall also have a service organization, located a reasonable distance from the jobsite, capable of maintaining the system once installed.
   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.

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. 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.

1.3 SUBMITTALS, SHOP DRAWINGS & MAINTENANCE MANUALS

A. 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.

B. Submittals shall be tab divided to aid in identifying the various sections of the submittal.

C. Shop drawings shall include complete floor plan drawings showing 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.

D. Point to Point termination charts shall be included, identifying all punch block, panel, and intermediate termination points, as well as defining wire and cable color codes and identification schemes to be followed throughout construction.

E. Maintenance manuals shall be compiled in accordance with the General Specifications, 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 operations
   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 Copy of major equipment manufacturer's standard warranty statements, for future reference and use, should claims need to be submitted.

1.4 TELEPHONE SYSTEM COORDINATION

A. The Intercom System is interfaced to an "Owner Provided" Telephone Switching System.
   1. Purpose of this interface is to allow any administrative phone in the building (if so programmed) to be able to function as a School Intercom operator's console capable of performing all of the standard control and communication functions of the operator's console, as defined elsewhere in this specification.
   2. Note that classroom (staff) telephones are NOT provided as part of this specification section and are NOT to be wired directly to the intercom system described herein.

B. Coordinate interface of the Intercom System to the Phone System in meeting with the Owner's IT Department.

   1. Prior to the start of work, meet jointly with representatives of the phone company and Owner's representatives to exchange information and agree on details of system operation, as well as final interface requirements of the new system.
   2. Primary goals of this meeting should be to-
      a. Establish a uniform dialing plan (UDP) that can be used with BOTH the intercom and phone system.
      b. Determine the best method for system interface (i.e.: CO trunk or SLI interface) and discuss the particulars of how this interface is to occur. (Note

that final interface decisions are determined not only by what intercom system goes in but also by what telephone system is provided.)

3. Record agreements reached in meetings and distribute record to other participants.
4. Establish a timeline to complete tasks that have been identified & agreed upon.

1.5 SYNCHRONIZATION WITH WIRELESS SECONDARY CLOCK SYSTEM

A. The Intercom and Program Clock System defined in the specification *shall be interfaced* to the Wireless Secondary Clock System, defined in separate spec section.

B. Purpose for this interface will be to allow the Program Clock Controller to receive periodic updates from the wireless clock controller, ensuring that both systems remain “in synch” with each other.

1.6 PAGING INTERCOM SYSTEM OPERATION

A. The Paging Intercom and Program Clock System shall be a microprocessor-based control system capable of performing standard intercom and paging functions, utilizing a telephone type operator's console as the primary call routing and control device, as well as program clock functions.

B. The system shall be configured to communicate with classrooms and other areas, direct program information and send time/tone signals to the classrooms.

1. The main system controller shall be located where shown on plans and need not occupy space in the main office.
2. The administrative telephones, provided as part of the Telephone Switching System, to locate in the main office, shall serve as the primary point where 2-way intercom and zone and all call page announcements can originate.
3. A separate telephone type desk set with LCD display, provided as part of this intercom system, shall be located in the main office, as noted on the plans, and serve as a backup instrument capable of initiating intercom and paging announcements, should the primary intercom links to the telephone switch fail or otherwise be out of service.
4. A Wall Mounted Digital Display Annunciator, to locate in the main office, as noted on plans, shall annunciate all routine and emergency call-in's that originate from call-in switches and non-dialing intercom staff phones, as well as to display current time & date information.

C. The system shall provide the following features, as a minimum:

1. Direct two-way voice communication between the operator's console (and/or any other Administrative telephone setup to work with the intercom system) to any classroom or any other speaker-equipped location.
2. Keypad room dialing from any operator's console.
3. A minimum of (12) watts of power shall be provided on the Intercom Channel to override high noise levels in such areas as shops and gymnasiums.
4. Distribute program information to any or all classrooms on a "select" and "all call" basis.

5. Distribute voice announcements from the operator's console and any other Administrative telephone to all speakers on both select and all call basis.
6. Sound a periodic warning tone signal over any speaker selected for two-way communications to alert persons in a room that the room is being monitored.
7. Allow zone paging to any one or all the independently programmable paging zones. Speakers may be assigned individually to any of the paging zones via software programming.
8. Provide facilities to positively prevent any Operator's Console from monitoring any classroom where the call-in switch is in the "Private" position; but still allow any Operator's Console to call the classroom.
9. Include a built-in compressor in the Intercom Channel for both "talk" and "listen" which shall automatically adjust for variations in voice levels.
10. Utilize voice operated switching (VOX) allowing the Operator's Consoles to communicate with connected room speakers without the need to use "push to talk" switches.
11. Generate audible and visual annunciation of calls coming into the main operator's console by means of beep tone and LCD type display.
12. Provide for the instantaneous distribution of emergency announcements from any Operator's Console to all locations equipped with loudspeakers, simply by accessing "all call" from the console. This action shall by-pass all controls, override all other programs, and transmit the emergency announcement at a preset volume level.
13. Allow program source audio information to be distributed to classrooms on an individual or all call basis, by pressing and otherwise selecting the appropriate buttons and switches on the controller.
    a. Reproduction of music or other recorded material from a USB input, for distribution to any or all speakers.

D. The ceiling and wall speakers in each room or speaker location shall be used to establish two-way communication between the selected classroom and the control console.

E. A programmable master time clock shall be integral to the intercom main system controller. The master time clock shall:

1. Generate time/tone (bell) signals indicating class change times. Times to be field programmable from the master clock.
2. Support a minimum of eight (8) full, independent schedules and assign them in software to any connected speaker point on both an individual and zoned basis. The controller shall also support a minimum of four (4) independent program schedules.

F. Room numbers displayed at the operator's consoles shall be fully field programmable and not dependent on physical point location in the system or otherwise restricted. Reprogramming at any time, to suit changes in building and system use, shall be possible, using standard programming tools (i.e.: a laptop computer with interface).

1. The system must support a ***flexible*** dialing scheme, allowing extension number assignments to match those of the telephone switch, being provided by others.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The equipment specified herein is the manufacture of Rauland-Borg & National Time Signal Corp. Similar equipment by Bogen, Dukane, Lathem Time, and Atlas-Sound shall be considered for approval, provided requests for approval are received at least ten (10) days prior to bid date and a full explanation of the proposed product substitution is offered. Notice of approvals shall be by addendum issued prior to bid date.

B. New speakers and accessories must work with existing system.

2.2 APPROVALS

A. Prospective bidders must show evidence that they are in the business of routinely providing the types of products and services described in these specifications and that they maintain a service office, located within a reasonable distance of the jobsite, with factory trained personnel that are equipped to provide quality service and support for the systems that they provide. Prospective bidders failing to provide such information will not be considered for approval.

B. Only those products regularly provided by the installing contractor for similar installations shall be considered for approval for this project.

1. Bidders shall show evidence that the products that they intend to provide for this project are of current manufacture and that those products are either inventoried by the Installing Contractor or are readily available from a reputable supply outlet in the local area.

C. 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.

D. 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 ten (10) days prior to bid date, fully describing the substitution.

E. Any exceptions to specifications, in terms of product appearance, configuration, operation or capabilities, which alter a potential bidders 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.

F. Notice of all bidder and product approvals shall be by addendum issued prior to bid date.

2.3 EQUIPMENT

A. The Paging Intercom and Program Clock System basis of design: Tele Center System, by Rauland Borg.

B. The system controller shall be sized in accordance with these specifications and be configured to support all the general features described throughout this specification. Additionally, the intercom controller shall:

1. Be of modular design, allowing for future growth of the system, as needs change. System shall be sized to support a minimum of 20% field device expansion, without the need to expand the controller or any associated switch banks or amplifiers.
2. Include a 12-watt built in two-way intercom amplifier to support conversations between any administrative phone and a connected classroom speaker station.
3. Use industry standard audio power amplifiers, sized to handle the entire connected building speaker load plus accommodate 40% future system growth, minimum. These amplifiers shall be used for program distribution and all call announcements. Power amplifiers shall accept line level audio inputs and provide 25 volt to the building speakers. The audio output lines shall be buffered by an audio output transformer that provides full isolation of the balanced pair speaker wiring from the amplifier. Amplifiers utilizing auto transformers or with the amplifier's output rail circuitry connected directly to the field load shall not be acceptable.
4. Audio Power Amplifiers shall be sized at 120 watts, ***minimum.***
   a. If deemed necessary, multiple amplifiers shall be provided, with loads distributed uniformly between the amplifiers.
5. Include an USB input capable of transmitting program material out to any or all selected classroom speakers.
6. Utilize a dedicated microprocessor to process and control all system operations.
7. Have all major pieces of equipment designed for mounting in standard 19" rack mount chassis and be configured for easy future access for service and repair.
8. Include a built-in master clock function capable of supporting time tone signaling for up to four schedules, as well as other clock features described elsewhere in this specification.
9. Be fully field programmable, using standard portable (laptop) computer connected to the controller through an USB data port.

C. The system control equipment shall be housed in a rugged, freestanding, rack type, enclosure.

1. The enclosure shall be sized for the application, with a minimum of 36" rack space. Provide blank closures for all unused sections.
2. A full support frame of 16-gauge welded CRS shall be integral to the console enclosure, and overall dimensions shall be 22"W x 41"H x 22"D. Furnish floor casters to allow easy movement.
3. Steel closure panels and frames shall be finished in textured black baked enamel.
4. Enclosure shall be Rauland RP1100B Series with all closures and accessories; or equal. Light gauge steel enclosures will not be considered equal.

D. In applications where the IC Controller is located in a finished office area, provide a NEMA 1 pull box (18" x 15" x 4" or larger, if needed) with flush cover, to locate directly behind the Main Intercom Controller and be used to route all intercom and control cables to the console.

1. Fit the flush cover plate with a grommeted cutout to pass all cables through the face.

E. All arriving intercom, speaker, control, and other wiring shall be routed to punch down blocks. S66 and M110 type punch down, mass termination blocks shall be used.

1. Wiring shall gather in MDF and IDF closets, prior to extending out to Master Controller.

F. Primary and Secondary Line Protection:

1. All speaker cabling that exits in 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. Primary protection devices shall be equal to Reliance Comm/Tec RPIB-series Termination Modules, with VSB gas tubes, or Porta Systems 504 series Protector Packs with 95B series gas tubes installed on each arriving line in the system. Size for the application.

G. Line Power Surge Protection:

1. All intercom system power supplies and peripheral equipment shall have their line side power connections made to suitable surge protection devices to be installed between the building's standard AC outlet (duplex) receptacle and the connected loads.
2. Line surge protection shall be equal to a PanaMax/TowerMax Model GUM 0600 Surge Protector with (6) protected outlets. The unit shall include 3 levels of MOV protection, clamping at 240VAC, as well as toroidal chokes and VHF capacitors providing instantaneous surge suppression to 45,000 amps with 960 joules of energy absorption. Outlets shall include both an "always on" outlet as well as switched outlets.

H. The backup operator's console, to locate in the main office as noted on the plans, shall be a Rauland TC6204, single line analog instrument, for desk use.

1. The console shall be standard dual tone twelve (12) button touch pad dialing type and feature both link and release pushbuttons. There shall be a lamp which indicates ringing visually and the electronic ringer shall have both level and frequency controls.
2. The operator's console shall be light beige in color and both the instrument housing and handset shall be of molded, high impact plastic.

I. Connection to the (administrative) telephone switching system, shall be by means of Rauland CTL-1 telephone adaptor modules with PLA-1 priority boards.

1. These modules shall have central office (CO) appearance to the EKSU phone switch, furnishing talk battery and recognizing loop start off hook from the switch.

J. Recess mounted ceiling speakers shall be Rauland USO188 type with 8" cone speaker, 5-ounce magnet and matching transformer. Provide ACC1000 round ceiling baffles, and

finish in baked gloss white enamel. Back box shall be ACC1110 with T-bar hanger supports. Atlas-Sound Model EZ-96-8 Backboxes and SD72W speakers shall be considered to be a suitable equal.

K. Surface mount wall speakers shall be installed at certain unfinished room and ceiling locations, as noted on plans. These speaker assemblies shall be white bake painted metal type, square in appearance and approximately 11.5" square and 4" deep.
   1. Provide 8" cone speakers with 5-ounce magnet and 70V match transformer, similar to Rauland Model No USO188.
   2. Provide white finished, square speaker baffles ***with subplates***, similar to Rauland model ACC1004.
   3. Provide white finished, square, surface mount backbox, similar to Rauland model ACC1102.

L. Surface mount ceiling speakers installed in open ceiling locations, as noted on plans. These speaker assemblies shall be black bake painted metal type, square in appearance and approximately 11.5" square and 4" deep.
   1. Provide 8" cone speakers with 5-ounce magnet and 70V match transformer, similar to Rauland Model No USO188.
   2. Provide black finished, square speaker baffles ***with subplates***, similar to Rauland model ACC1004.
   3. Provide black finished, square, surface mount backbox, similar to Rauland model ACC1102.

M. Paging/Talk-Back trumpets (to locate in Gymnasium and Boiler Areas) shall be a Rauland 3601 type (or equal Atlas-Sound model AP15T), of die cast aluminum construction with ABS plastic cone projector. Unit shall be capable of delivering a maximum of (15) watts full audio at (25) volts.

N. Exterior flush wall mount speaker assemblies shall be provided where shown on plans. They shall be equal to Atlas-Sound, designed specifically for exterior use and be comprised of the following major pieces. Loudspeaker shall be APF-15T, high efficiency, 15-watt type with compression driver. Backbox shall be flush mount model 193-8-6, 9.6" square and 6" deep. Backbox shall be undercoated and painted with an epoxy paint, to resist corrosion. Baffle shall be equal to VP161A-APF, made of reinforced aluminum alloy and finished in textured white epoxy. Baffles shall be 10.75" square.

O. Volume controls shall be provided where shown on plans. They shall be Rauland ACC1300 or equal, (10) watt rated, autotransformer type for single gang mounting.

P. Intercom Cable shall be equivalent to West Penn 25352 with (1) twisted shielded pair and (1) non-shielded wire, 24 gauge. Cable to be Class 3 plenum rated. One cable shall be home run from each room station or speaker area back to the main controller.

Q. Corridor speaker cable shall be equivalent to West Penn 25293 with (1) twisted, shielded pair, 18-gauge wire. Cable to be Class 3 plenum rated. All corridor speakers in each area are to be connected together to form one paging zone, per area, as noted on plans.

R. Where intercom cables are gathered first at an IDF communications closet and then extended back to a central MDF closet and system headend, multipair intercom cable shall be used for this extension.

1. Multipair intercom cable shall be 25 pair, 24-ga size, with overall shield and PVC (or plenum) jacket and be rated for CL3 and CM applications. 24-ga wiring is NOT acceptable for intercom homerun multipair use.

S. All intercom, speaker, and control cable that is to be run "free air" above accessible ceilings, if elsewhere allowed by these specifications, shall be rated for PLENUM use.

T. A six pair, Category 3, plenum rated telephone cable shall be provided to interconnect the intercom controller to the telephone switch. This cable shall extend between the two switch locations and be terminated into S66 blocks at both ends and properly identified as to use.

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 INSTALLATION

A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, counters, accessible lay-in tile 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.

1. Where cable is run “free air” in accessible lay-in tile ceiling spaces, 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 exposed 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.
    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. Cable distribution rings or hangers shall be wall or ceiling mounted above accessible corridor ceilings at 8-foot intervals.
    e. Cables shall not be laid on or draped across any ceiling tiles, grids, electrical or mechanical fixtures. Maintain at least a 2-foot separation between the communications cables and fluorescent or HID lighting.

B. Install cable without damaging conductors, shield, or jacket.

C. 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.

D. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

E. Use splice and tap connectors compatible with media types.

3.3 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. All shields shall be maintained whole and unbroken and isolated from ground at all locations except the control headend.

C. To ensure proper grounding, a separate green #6 copper wire shall be provided between the Intercom main controller and the main electrical service entrance central ground reference location. Grounding and bonding shall conform to NEC requirements.

3.4 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. In MDF & IDF Closets, line walls with ¾” plywood backboards. Paint backboards with two coats of gray fire-retardant paint.

B. Group connecting hardware for cables into separate logical fields.

C. Mount termination blocks, terminal strips, connecting hardware, and cable management equipment on backboards, unless otherwise indicated.

D. All arriving intercom, speaker, control, and other wiring shall be routed to punch down blocks. S66 and M110 type punch down, mass termination blocks shall be used.

E. 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.

3.5 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 by 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.

3.6 TESTING

A. The System shall be tested, prior to acceptance, by a factory-trained representative of the manufacturer, at a time designated by the Architect/Engineer or owner. Manufacturer's representative shall provide a letter detailing the date and scope of all tests conducted and shall certify in writing that all tests have been performed and that results of these tests are satisfactory.

B. General testing:

1. Visually inspect all cable runs and components for proper class listings and check all terminations for the correct color codes.
2. Test all wires for continuity, shorts, grounds, and polarity.

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.

D. 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.

E. 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.

3.7 TRAINING

A. The owner’s representative and key staff personnel shall be trained in proper operation of the system.

B. Training is to be conducted on-site by a representative of the equipment supplier, who is familiar with the installation and the intended use of the system.

C. The contractor shall provide a minimum of two (2) on-site training sessions, to last no more than two (2) hours each, prior to final acceptance of the system, at a date and time desired by the owner.

D. Separate maintenance type training sessions shall be conducted to familiarize the owner’s maintenance staff with routine maintenance and field programming features of each system. A minimum of two (2) hours on-site of training shall be provided.

3.8 WARRANTY

A. The entire installation shall be guaranteed against all defects in materials and workmanship for a period of one (1) year from date of installation & final acceptance. Factory-trained personnel, employed by the equipment supplier, shall provide first response to a problem during the warranty year. This response is to include maintenance, repair, or replacement of any equipment found to be defective, provided the defect is not caused by misuse, abuse, neglect, or unauthorized tampering or modification. All labor, shipping, transportation, and related expenses are to be at no additional cost to the owner for any guarantee service provided.

END OF SECTION 27 5123

SECTION 27 5313 – DIGITAL CLOCK SYTEMS

1.1 SECTION INCLUDES

A. Transmission Systems
   1. Existing American Time 10 Watt Transmitter
      a. Located in High School
B. Clocks
   1. Analog (wired)

1.2 RELATED SECTIONS

A. Electrical (120 volt grounded outlet required for transmitter).

1.3 SYSTEM DESCRIPTION

A. GPS wireless clock system shall continually synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired.
B. The system shall synchronize all clocks to each other. The system shall utilize GPS technology to provide atomic time. The system shall not require hard wiring. Clocks shall automatically adjust for Daylight Savings Time. The system shall include a network interface to provide time signal to the WAN so all clocks in the school district shall receive the same time signal.
C. Analog Clocks shall be synchronized to within 10 milliseconds 6 times per day, and the system shall have an internal oscillator that maintains plus or minus one second per day between synchronizations, so that clock accuracy shall not exceed plus or minus 0.2 seconds.
D. The system shall include an internal clock reference so that failure of the GPS signal shall not cause the clocks to fail in indicating time.
E. The system shall incorporate a “fail-safe” design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.
F. Clock locations shall be as indicated, and clocks shall be fully portable, capable of being relocated at any time.
G. The system must operate in accordance with a “Radio Station Authorization”, Form FCC 601 – LM, granted by the Federal Communications Commission (FCC). This license will be issued to and held by the end user.

1.4 SUBMITTALS

A. Product Data: Submit complete catalog data for each component, describing physical characteristics and method of installation. Submit brochure showing available colors and finishes of clocks.
D. Manufacturer's Instructions: Submit complete installation, set-up and maintenance instructions.
E. Floor plans indicating the location of system transmitter(s), approved by manufacturer, will be submitted to owner prior to installation.

1.5 SUBSTITUTIONS

A. Proposed substitutions to be considered shall be manufactured of equivalent materials that meet or exceed specified requirements of this Section.
B. Proposed substitutes shall be identified not less than 10 days prior to bid date.

C. Other systems using wireless technology that are not capable of being connected to the existing system will not be accepted.

1.6 QUALITY ASSURANCE

A. Permits: Obtain operating license for the transmitter from the FCC.
B. Qualifications:
   1. Manufacturer: Company specializing in manufacturing commercial time system products with a minimum of 30 continuous years of documented experience including 4 years experience producing GPS wireless time systems.
   2. Installer: Company with documented experience in the installation of commercial time systems.
C. Prior to installation, a site survey must be performed to determine proper transmitter placement.

1.7 DELIVERY STORAGE AND HANDLING

A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information.
B. Store equipment in finished building, unopened containers until ready for installation.

1.8 PROJECT SITE CONDITIONS

A. Clocks shall not be installed until painting and other finish work in each room is complete.
B. Coordinate installation of GPS receiver for access to the roof or exterior side wall so that the bracket and related fasteners are watertight.

1.9 SYSTEM STARTUP

A. At completion of installation and prior to final acceptance, turn on the equipment; ensure that all equipment is operating properly, and that all clocks are functioning.

1.10 WARRANTY

A. Manufacturer will provide a 5 year warranty on GPS receiver, transmitter, and satellite transmitter. All other components will have a 1 year warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. American Time (Existing)
B. Approved Equal

2.2 SEQUENCE OF OPERATION

A. Transmitter Operation: When power is first applied to the transmitter, it checks for and displays the software version. It then checks the position of the switches and stores their position in memory. The transmitter looks for the GPS time signal. Once the transmitter has received the GPS time, it sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmitter updates its internal clock every time it receives valid time data from the GPS.
B. Analog Clock Operation:
   1. Apply power or insert batteries. Follow set up procedures detailed in manufacturer’s instructions.

2. After initial setup, the clock will shut off the receiver. Six times each day, the microprocessor will activate the receiver and starting with the stored channel, it will again look for a valid time signal. If necessary, the clocks will resynchronize to the correct time.
3. If the clock has not decoded a valid time signal for a pre-determined number of days, it will go to a step mode. Non signal reception can be caused by low battery voltage. If this occurs, replace the batteries.

2.3 EQUIPMENT

A. General: The clock system shall utilize existing transmitters, repeaters, provide all accessories for complete operation.

B. Traditional analog clocks (wired): Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black. 12 inch diameter analog clock: American Time Model SG56BAAD304B#. Verify Signal Circuit number with owner prior to ordering.
   1. Analog clocks shall be 120V, 1 phase..
   2. Analog clocks shall be capable of automatically adjusting for Daylight Saving Time. An on-off switch located on the transmitter shall disable this function if desired.
   3. Time shall be automatically updated from the transmitter 6 times per day.
   4. Provide 120 volt power adapter with 6 foot cord.
   5. 12 inch analog clocks shall have a tamper proof/theft resistant clock lock mounting slots.
   6. If the transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded. If signal transmission is not restored after 48 hours, the second hand will “five step” as a visual indicator that the signal has been lost. Should the clocks lose power and signal, the clocks will not function.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that construction is complete in spaces to receive equipment and that rooms are clean and dry.
B. Verify that 120 volt electrical outlet is located where clock shall be located and provide clock receptacle for appropriate mounting of clock.

3.2 INSTALLATION

A. GPS Unit: Install on the roof in location in clear view of the sky. Install unit in location free from standing water, and above accumulations of snow. Seal cable connection to GPS with cable connection sealant. Any added cable lengths must be protected from outside elements.

B. Clock Receptacle: Provide Clock receptacle at location shown and provide connection to nearest 120 volt circuit within room of clock mounting. Clock Receptacle equal to P&S Model S3713-W

C. Analog clocks (wired): Perform the following operations with each clock:

1. Set clock to correct time in accordance with manufacturer's instructions.
3. Observe analog clock until valid signals are received and analog clock adjusts itself to
   correct time.
4. Install the analog clock on the wall in the indicated location, plumb, level and tight against the wall. If using 12 inch clock, attach using clock-lock hanging method and suitable fasteners as approved by clock manufacturer.

3.3 ADJUSTING

A. Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

3.4 CLEANING

A. Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer. Remove temporary labels from clock faces. Do not remove labels from backs of clocks.

3.5 DEMONSTRATION

A. Provide training to Owner's representative on setting and adjusting clocks, replacing batteries and routine maintenance.

3.6 PROTECTION

A. Protect finished installation until final acceptance of the project.

3.7 TESTING

A. All devices must be tested at their operational location under normal operational conditions to assure reception of signal.

END OF SECTION 27 5313

SECTION 28 4621 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Remote annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.

1.2 ACTION SUBMITTALS

A. General Submittal Requirements:

1. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level III or IV minimum.

B. Product Data: For each type of product, including furnished options and accessories.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.

10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Locate detectors according to manufacturer's written recommendations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 260500, include the following:

    a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between all devices and equipment.
    d. Riser diagram.
    e. Record copy of site-specific software.
    f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

        1) Equipment tested.
        2) Frequency of testing of installed components.
        3) Frequency of inspection of installed components.
        4) Requirements and recommendations related to results of maintenance.
        5) Manufacturer's user training manuals.

    g. Manufacturer's required maintenance related to system warranty requirements.
    h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission and an emergency voice/alarm communications system. (Voice Evacuation)

B. Speaker/Strobe evacuation by building occupancy type and local jurisdiction

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.

6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
8. Activate emergency shutoffs for gas and fuel supplies.
9. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturer:

1. Existing Manufacturer: Siemens Industry, Inc.; Fire Safety Division.
   a. Current service agent:
      1) Automatic Building Controls (ABC) – Phone # (605) 336-1200

B. General Requirements for Fire-Alarm Control Unit:

1. Bases of design: Siemens Cerberus Pro – Intelligent Voice System

2. Remote Microphone Kit: Model VR2005
   a. Coordinate location of kit with owner in main administration office.

3. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
4. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
5. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 2.

E. Notification-Appliance Circuit:
1. Audible appliances shall be voice/alarm communications Type. (Voice Evacuation)
2. Where permissible by building occupancy type, audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
3. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
4. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Single-action mechanism, breaking-glass or plastic-rod, or pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
4. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

    a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
    b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
    c. Multiple levels of detection sensitivity for each sensor.
    d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.7 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Speaker: For Voice Evacuation.
1. Ceiling Speakers: Siemens SL Series

C. Chimes: Vibrating type.

D. Speaker/Strobe Combinations.
1. Ceiling Mounted: Siemens SL Series
2. Wall Mounted: Siemens SL Series

E. Amplifiers:
1. System provide shall design voice notification system and provide amplifiers as required.
2. Coordinate amplifier locations with electrical contractor for supply power.
3. Coordinate amplifier locations with owner prior to installation rough-in.

F. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Mounting: Wall mounted unless otherwise indicated.
2. Flashing shall be in a temporal pattern, synchronized with other units.
3. Strobe Leads: Factory connected to screw terminals.
4. Mounting Faceplate: Factory finished, red or white, verify color at time of shop drawings.

2.9 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.

B. Material and Finish: Match door hardware.

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall, to circuit-breaker shunt trip for power shutdown, or Boiler Shutdowns.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture a telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Equipment Mounting: Install fire-alarm control unit on finished floor.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

G. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

H. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 284621

SECTION 311000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary

B. Section 015000 - Temporary Facilities and Controls

C. Section 017000 - Execution and Closeout Requirements

D. Section 024100 - Demolition: Removal of built elements and utilities.

E. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 017000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.

C. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

D. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

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

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 312200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading the site structures and paving.

C. Finish grading for planting.

1.02 RELATED REQUIREMENTS

A. Geotechnical Exploration Report.

B. Section 311000 - Site Clearing.

C. Section 312323 - Fill: Filling and compaction.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soils: as identified in the Geotechnical Exploration Report.

B. Unsatisfactory Soils: as identified in the Geotechnical Exploration Report.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

E. See Section 312323 for filling procedures.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL STOCKPILING

A. Stockpile topsoil to be re-used on site.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches prior to topsoil placement.

E. Place topsoil to the following minimum compacted thicknesses:
   1. Areas to be Seeded with Turfgrass: 6 inches.
   2. Turf Areas at Tree Locations: 18 inches x 20'-0" diameter
   3. Plant Beds: 18 inches.

F. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

G. Lightly compact placed topsoil.

H. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.08 FIELD QUALITY CONTROL

A. See Section 312323 for compaction density testing.

B. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

C. Allow 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.

D. 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.

E. 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.

3.09 CLEANING

A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312323
FILL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Filling and compacting for paving and site structures.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Geotechnical Exploration Report Soil Technologies, Inc.; STI #22-1782: bore hole locations, findings of subsurface materials, and recommendations.

B. South Dakota DOT Standard Specifications for Roads and Bridges.

C. Section 312200 - Grading: Site grading and topsoil.

D. Section 321216 - Asphalt Paving: Subgrade preparation below paving.

E. Section 321313 - Concrete Paving: Subgrade preparation below paving.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

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. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2021, with Errata (2022).

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2019.

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).

1.05 SUBMITTALS

A. Materials Sources: Submit name of imported materials source.

B. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: as identified in the Geotechnical Exploration Report; free of rock and gravel larger than 3 inches in any dimension, debris waste, frozen materials, vegetation and other deleterious matter.

C. Unsatisfactory Soils: as identified in the Geotechnical Exploration Report.
   1. Unsatisfactory soils also includes satisfactory soil types not maintained within optimum moisture content at the time of compaction.

D. Topsoil: See Section 312200.

2.02 ACCESSORIES

A. Geotextile: nonwoven separation.
   1. Mirafi 170N.

2. Linq GTF-200.

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 areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Follow recommmendations of Geotechnical Exploration Report.

B. 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. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 6 inches compacted depth.

G. Slope grade away from building minimum 10 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
   1. The slope can be reduced to 1/4 inch per foot in areas that are completely surfaced and properly sealed with asphalt or concrete.

H. Compaction Density as determined by standard Proctor (ASTM D698):
   1. Subgrade Fill: Follow recommmendations of Geotechnical Report.
   2. At landscape areas: 92 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

J. 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.

B. Soil Fill Materials:
   1. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
   2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
   3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
   4. Frequency of Tests: as recommended by Owner's Geotechnical Engineer..
   5. Proof roll compacted fill at surfaces that will be under paving.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 312323

SECTION 312323.43
GEOFOAM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid plastic foam block fill and accessory materials.

1.02 RELATED REQUIREMENTS

A. Section 312323 - Fill: Filling, backfilling, and compacting soil material.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.
B. Subgrade Elevations: 6 inches below finish grade elevations indicated on drawings, unless otherwise indicated.

1.04 REFERENCE STANDARDS

A. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geofoam 2017 (Reapproved 2021).
B. ASTM D7557/D7557M - Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens 2009 (Reapproved 2021).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data for Manufactured Fill.
C. Shop Drawings for Manufactured Fill.
   1. Submit plan, section, and profile drawings. Indicate size, type, location, and orientation of each geofoam block.
   2. Submit location and type of connectors.
   3. Indicate proposed weighting or guying.
D. Materials Sources: Submit name of imported materials source.
E. Manufacturer's Instructions.
F. Designer's Qualification Statement.
G. Specimen Warranty.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Perform design of geofoam structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.
C. Manufactured Fill - Geofoam: Review manufacturer's care and handling instructions. Prevent damage to material during delivery, storage, and construction activity.
   1. Cover stored geofoam with opaque material when geofoam will exposed to sunlight for more than six months.
   2. Protect material from organic solvents, petroleum-based solvents, and open flame.
   3. Follow manufacturer's written procedures for handling and installation of geofoam material.
   4. Do not place heavy construction equipment or vehicles directly onto geofoam material.
   5. Replace geofoam material damaged when by construction equipment or activity, or repair according to manufacturer's written repair criteria and procedures.

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.
C. Provide ten year manufacturer warranty for manufactured fill material.

PART 2 PRODUCTS

2.01 MATERIAL

A. Manufactured Fill - Geofoam: Rigid foam plastic blocks.
   1. Material: Expanded polystyrene (EPS), clearly marked with manufacturer name and product type.
   2. Fasteners: Geofoam manufacturer's standard galvanized or stainless steel grip plates that resist 60 pounds lateral force, minimum, when barbs are fully embedded in geofoam blocks.
   3. Adhesive: Urethane construction adhesive, recommended by geofoam manufacturer.
   4. Manufacturers:
      a. Atlas Molded Products, a Division of Atlas Roofing Corporation: www.atlasmoldedproducts.com/#sle.
      b. Insulfoam LLC: www.insulfoam.com/#sle.
      c. Benchmark Foam.
      d. Substitutions: See Section 016000 - Product Requirements.

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.

3.02 PREPARATION

A. Maintain excavations until ready to install geofoam. Prevent loose soil from falling into excavation.

3.03 FILLING, GENERAL

A. See Section 312323.
B. Fill to contours and elevations indicated using unfrozen materials.
C. Fill up to subgrade elevations unless otherwise indicated.
D. Employ a placement method that does not disturb or damage other work.
E. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
F. Maintain optimum moisture content of fill materials.
G. Correct areas that are over-excavated.
H. Reshape and re-compact fills subjected to vehicular traffic.

3.04 MANUFACTURED FILL INSTALLATION - GEOFOAM

A. Provide finish grade free of holes and protrusions.
B. Install 8 inch leveling pad of granular, permeable material approved by Architect.
C. Place geofoam fill as shown on drawings.
D. Cut blocks with hot wire. Cutting with hand tools, with power tools, or by breaking block material is not permitted.
E. Offset each layer of blocks 2 feet from adjacent rows.
F. Rotate each layer of blocks 90 degrees in the horizontal plane relative to previous layer.
G. Connectors and Adhesive:
   1. Install connectors and adhesive as directed in geofoam manufacturer's written instructions.
   2. When mechanical connectors are used, install a minimum of two (2) connectors for each 4 feet by 8 feet section of material.
H. Provide temporary weighing and guying required to protect geofoam material until soil cover or pavement is in place.
I. Avoid damage to geofoam material during other construction activities. Replace or repair damaged geofoam.

3.05 TOLERANCES

A. Top Surface, Each Layer: Maximum 5/8 inch variation in any 10 foot interval.
B. Top Surface, Areas to Receive Pavement: Zero to minus 2-3/8 inch below indicated grade.
C. Top Surface, Slopes: Within plus or minus 3-5/8 inch of indicated grade.
D. Vertical Joints: No gaps greater than 3/4 inch.

3.06 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 321123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. South Dakota Department of Transportation (SDDOT) Standard Specifications for Roads & Bridges, 2015 Edition, including all subsequent revisions.
   1. Section 260 – Granular Bases and Surfacing
   2. Section 882 – Aggregates for Granular Bases and Surfacing

B. Section 312323 - Fill: Compacted fill under base course.

C. Section 321216 - Asphalt Paving: Finish and binder asphalt courses.

D. Section 321313 - Concrete Paving: Finish concrete surface course.

1.03 SUBMITTALS

A. Gradation and source of all granular bases and surfacing.

B. Compaction Density Test Reports.

1.04 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. Aggregate Storage, General:
   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 MATERIALS

A. Aggregate Base Course shall be in accordance with SDDOT Standard Specifications Section 260. Material for base course shall meet requirements set forth in SDDOT Standard Specifications Section 882.

2.02 SOURCE QUALITY CONTROL

A. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. 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. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Aggregate Base Course shall be compacted with pneumatic rollers and shall continue on each lift of the base course until the surface is firm and unyielding, and attains a density of 97% of the maximum dry density as determined by SD 104, Method 4 and SD 105 or SD 114.

B. Under Bituminous Concrete Paving:
   1. Place aggregate base course to a total compacted thickness as indicated on plans.
   2. Compact to 97 percent of maximum dry density.

C. Under Portland Cement Concrete Paving:
   1. Place aggregate base course to a total compacted thickness as indicated on plans.
   2. Compact to 97 percent of maximum dry density.

D. Place aggregate in maximum 4 inch layers and roller compact to specified density.

E. Level and contour surfaces to elevations and gradients indicated.

F. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

G. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Proof roll compacted aggregate at surfaces that will be under paving.

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

SECTION 321216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hot-mix asphalt patching.

B. Hot-mix asphalt paving.

C. Pavement-marking paint.

1.02 REFERENCES

A. South Dakota Department of Transportation (SDDOT) Standard Specifications for Roads & Bridges, 2015 Edition, including all subsequent revisions.

B. Section 320: Asphalt Concrete, General
   1. Section 321: Asphalt Concrete – Class D, E, G
   2. Section 330: Prime, Tack, Fog Seal, and Flush Seal
   3. Section 880: Aggregates for Asphalt Surface Treatments
   4. Section 890: Asphalt Materials

1.03 RELATED REQUIREMENTS

A. Section 312200 - Grading: Preparation of site for paving and base.

B. Section 321123 - Aggregate Base Courses: Aggregate base course.

C. Section 321313 - Concrete Paving: Concrete curbs.

1.04 SUBMITTALS

A. Mix Design: The supplier shall furnish a job mix formula for approval prior to asphalt production. All job mix designs shall have a laboratory designation number that can be printed on all weigh tickets that correspond to the type of asphalt concrete mix, binder designation, percent new asphalt binder and percent binder from RAP. The Engineer may accept the mixture on the basis of the certificate of compliance, job mix formula and visual inspection or may test the mixture for specification compliance.
   1. Materials not meeting specification will be rejected and replace at the supplier's expense.

B. Material Certifications.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the SD DOT.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the South Dakota Standard Specifications for Roads and Bridges – Current Edition, and Supplemental Specifications for asphalt paving work.

C. Testing Service: The Owner will engage a qualified independent testing agency to perform material evaluation tests during construction.

1.06 FIELD CONDITIONS

A. Seasonal Limitations:

B. Asphalt Concrete Composite will not be laid if the underling surface is wet or frozen.

C. Temperature for lower lifts shall be, at minimum, 35 degrees Fahrenheit, with a forecast of holding or rising temperatures.

D. Temperatures for top lift shall be, at minimum, 40 degrees Fahrenheit, with a forecast of holding or rising temperatures. If warm mix asphalt is used, the temperature requirement for the top lift shall be 35 degrees Fahrenheit, with a forecast of holding or rising temperatures.

E. The Engineer may require tarping of loads during cool or windy conditions.

F. Paving may be suspended by the Engineer when temperatures near the minimum allowable are combined with windy conditions. The Engineer will take into account whether or not the

contractor is utilizing good cold weather practices, including tarping of loads and close roller operations, prior to making his decision. The Engineer's decision regarding paving operations shall be final.

G. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F

PART 2 PRODUCTS

2.01 GENERAL

A. Specifications to be used for this section shall be the South Dakota Department of Transportation Standard Specifications for Roads and Bridges - Current Edition with the following modifications, and/or special provisions.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Asphalt concrete composite shall conform to the SDDOT Specifications for Class G, Asphalt Concrete. The top lift shall conform to Class G-2 for the mineral aggregate specifications. All lower lift(s) shall conform to Class G-1 or G-2 for the mineral aggregate specifications unless otherwise noted or by direction of the Engineer. The surface course shall not exceed 2" in thickness when laid and compacted.

B. A maximum of 20% (by weight) of Recycled Asphalt Pavement (RAP) will be allowed in the asphalt concrete composite mix. RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials shall not be used. No other recycled material will be allowed. Representative RAP samples shall be sent into the laboratory designated by the Engineer for material classification. The laboratory shall provide the following information for RAP: Asphalt Binder Content, gradation and G_{mm} (Maximum Specific Gravity). RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials shall not be used.

C. The asphalt cement used in the mixture shall be Performance Graded AASHTO Designation PG 58-28, and shall conform to the current SDDOT Specifications. Certificates of compliance will be required on the performance graded asphalt binder. The ratio of added new asphalt binder to total asphalt binder (including binder from RAP) shall be 70 percent or greater.

D. Tack coat (SS-1h or CSS-1h) shall be applied between each lift of asphalt and along existing concrete and asphalt faces and any areas as determined by the Engineer at an application rate resulting in undiluted residual asphalt of .05 gal/sq. yd.

2.03 AUXILIARY MATERIALS

A. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
   1. Color: TBD.

PART 3 EXECUTION

3.01 GENERAL

A. The construction requirements and material handling shall conform to the requirements of Section 320/321, Section 880, and Section 890 of the South Dakota Department of Transportation Standard Specifications for Roads and Bridges, 2015 Edition.

3.02 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.03 PLACING ASPHALT PAVEMENT

A. Placement of asphalt concrete shall be by self-propelled pavers. Asphalt concrete pavement placement and compaction equipment and methods shall meet requirements as set forth in SDDOT Standard Specifications Section 320 and the following notes.

B. Compaction of asphalt concrete shall be by the specified density method. The minimum density requirement is 92% (Rice Method) of specified density or to the satisfaction of the Engineer.

C. Intermediate and/or top lifts shall not be placed until the underlying layer has cooled to 175 degrees Fahrenheit or below. Also, if the contractor's paving operation is damaging the underlying asphalt, paving shall be suspended until the asphalt can withstand the paving operation or an alternate paving operation which does not cause damage is determined.

D. Longitudinal Joints:
   1. Rolling operations for confined edges, the first pass adjacent to the confined edge, the compaction equipment shall be entirely on the hot mat 6" from the longitudinal joint.
   2. Rolling operations for un-confined edges, the compaction equipment shall extend 6" beyond the edge of the mat.
   3. Longitudinal joints of succeeding lifts should be offset approximately 6".
   4. Longitudinal joints should be on the lane lines in the top lift. A paving plan will be required from the Contractor.

END OF SECTION

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete walks, curbs, curb and gutter, and pavement.

1.02 RELATED REQUIREMENTS

A. South Dakota Department of Transportation (SDDOT) Standard Specifications for Roads & Bridges, 2015 Edition, including all subsequent revisions.
   1. Section 380 – Portland Cement Concrete Paving
   2. Section 462 – Concrete for Incidental Construction – Class M
   3. Section 650 – Concrete Curb & Gutter
   4. Section 651 – Concrete Sidewalk

B. Section 312200 - Grading: Preparation of site for paving.

C. Section 312323 - Fill: Compacted subbase for paving.

D. Section 321123 - Aggregate Base Courses.

1.03 SUBMITTALS

A. Product Data: Provide data on joint filler, admixtures, and curing compound.

B. Design Data: Concrete mix design.

1.04 QUALITY ASSURANCE

A. The Owner will be responsible for conducting Portland Cement concrete testing.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish concrete paving work.

B. Form Materials: Plywood, wood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for all curves with a radius. For all curved pavement with a radius of 100 feet or less, set forms using a center pivot point and a flexible tape measure to swing a uniform arc.

C. Formwork Accessories
   1. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
      a. Composition: Colorless, reactive, water-based or solvent-based compound.
      b. Do not use materials containing diesel oil or petroleum-based compounds.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: Provide in accordance with South Dakota DOT Standard Specifications for Roads and Bridges.

C. Coarse Aggregate: Conform to Section 820 of the SD DOT Standard Specifications for Class A aggregate.
   1. Crushed Ledge Rock is required.

D. Fine Aggregate: Conform to Section 800 of the SD DOT Standard Specifications.

2.04 ACCESSORIES

A. Curing Compound: All concrete shall be cured with a white pigmented linseed oil base emulsion compound. Application of the curing compound shall be in accordance with section 380.3.M.2 of the SDDOT Standard Specifications for Roads and Bridges. Curing compound material shall be in accordance with section 821.1.C.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D8139, semi-rigid, closed-cell polypropylene foam.

2.05 CONCRETE MIX DESIGN

A. Concrete shall conform to the requirements for Class M6 concrete as per Section 462 of the latest Edition of the South Dakota Department of Transportation Standard Specifications for Roads and Bridges.
   1. Minimum 4000 psi compressive strength at 28 days.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Prepare base course in accordance with South Dakota DOT Standard Specifications for Roads and Bridges.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

3.06 PLACING CONCRETE

A. Coordinate installation of snow melting components.

B. Place concrete in accordance with South Dakota DOT Standard Specifications for Roads and Bridges.

C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.07 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 1/2 inch wide expansion joints at 35 foot intervals and to separate paving from vertical surfaces and other components.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored or sawn joints.
   1. At locations as indicated on plans.

D. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/4 minimum into depth of slab.

3.08 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.
   2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
   3. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
   1. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.

END OF SECTION 321313

SECTION 321816.13
PLAYGROUND PROTECTIVE SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing protective surfacing and correction of grades as necessary.

B. Protective surfacing for playground area.
   1. Base Bid: Engineered Woof Fiber Fill.
   2. Alternate: Poured-in-Place Permeable Surfacing.

C. Subbase under resilient surfacing.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 116813 - Playground Equipment: Playground layout (staking).

C. Section 321123 - Aggregate Base Courses: Subbase for resilient surfacing.

D. Section 321313 - Concrete Paving: Subbase for resilient surfacing.

1.03 REFERENCE STANDARDS

A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)) 2012 (Reapproved 2021).

B. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment 2018, with Editorial Revision (2020).

C. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use 2021.

D. ASTM F2075 - Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment 2020.

E. CPSC Pub. No. 325 - Public Playground Safety Handbook 2015.

1.04 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

1.05 SUBMITTALS

A. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
   1. Include IPEMA certifications where required.

B. Shop Drawings: Detailed scale drawings showing locations of proposed playground equipment and exposed footings, bases, and anchorage points.
   1. Clearly identify footing and base elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing.

2. Show locations of underground utilities.
3. Show measured fall height for each playground equipment item, determined in accordance with ASTM F1487.
4. Show Use Zone perimeters, determined in accordance with ASTM F1487.

C. Samples: For each product for which color must be selected provide color chart showing full range of colors.

D. Maintenance Data:
1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.
2. For loose fill surfacing products, provide detailed re-ordering information to enable Owner to match installed material exactly.

E. Manufacturer's Field Report.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than five years of documented experience.
1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing the protective surfacing; provide installer's company name and address, and training and experience certificate.

1.07 PRE-INSTALLATION MEETING

A. Convene a meeting one week before installation to discuss coordination between various installers.
1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
2. Include representatives of Contractor.
3. Notify Owner at least 2 weeks prior to meeting.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store protective surfacing to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 7 year warranty for playground surfacing.

PART 2 PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Because the safety of the playground depends on strict compliance with the performance criteria, this information is provided for Contractor's information.
1. The protective surfacing constitutes a resilient layer installed over a non-resilient layer, which is installed over the subgrade, with the top of playground equipment footings and anchorage devices covered by full depth of the resilient portion of the protective surfacing.
2. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
3. Use Zone: The protective surfacing has been designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height of 10 feet.

2.02 MATERIALS

A. Poured-In-Place Permeable Surfacing: Shredded rubber bonded with polyurethane adhesive, allowing water penetration, over subgrade.

1. Rubber: 100 percent recycled shredded styrene butadiene rubber (SBR) shreds or granules.
2. Color: Determined by Owner based on manufacturer color selections. Each color selection to consist of 50% black and 50% color granuals.
3. Resilient Depth: 4-1/2 inches, maximum.
4. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.

B. Engineered Wood Fiber Fill: Manufactured for the purpose of protective surfacing; complying with ASTM F2075; do not use mulch manufactured from recycled pallets, or lumber containing nails or metal fasteners.
1. Depth: As required to achieve specified Critical Fall Height as defined in ASTM F1292 but not more than depth indicated; maintain top elevation flush with adjacent grades.
2. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.
3. Manufacturers:
a. Fibar Systems: www.fibar.com/#sle.
b. GameTime, Inc: www.gametime.com/#sle.
c. Sof' Fall: www.sof-fall.com/#sle.

C. Geotextile: Nonwoven polypropylene sheet.

D. Aggregate Subbase: See Section 321123.

PART 3 EXECUTION

3.01 PREPARATION FOR REPLACEMENT OF EXISTING LOOSE FILL SURFACING

A. Remove existing loose fill.

B. Measure the location of all playground elements, including perimeter of existing protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

C. Stake the layout of the entire Use Zone perimeter before starting any work, based on Contract Documents.
1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
2. Do not proceed until revised drawings have been provided, showing corrected layout.

D. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

E. After subgrade is correct, mark intended depth of surfacing on the base supports of each item of playground equipment using paint or tape in a manner that will be easily verifiable during installation of surfacing.

3.02 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment installation is complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.03 PREPARATION

A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

3.04 SUBBASE

A. Install aggregate subbase as indicated on drawings and in Section 321123. Compact aggregate to maximum 97 percent, in accordance with ASTM D1557.

B. Install concrete subbase as indicated on drawings.
   1. Thickness: 4 inches.
   2. Remove curing compounds and other substances that will adversely affect adhesion.

C. Cure subbase at least 7 days but not less than required by manufacturer of resilient surfacing.

3.05 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Poured In Place Surfacing:
   1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
   2. Install seamlessly; ensure complete bond to subbase.
   3. Cover footings and foundations and adhere tightly around penetrating elements.
   4. Maintain full thickness of resilient layers within Use Zone; cover or abut containment curbs as indicated on drawings; completely cover tapered transition edges.
   5. Hand trowel exposed surface to smooth, even finish.
   6. Impact Attenuation Layer: Install entire layer in one continuous pour on the same day.
   7. Wear Surface: Bond wear surface to substrate with adhesive. Apply adhesive in small quantities so that wear surface can be applied before adhesive dries.
      a. Install surfacing seamlessly. When wear surface is composed of different color patterns, pour surface continuously and seamlessly.
      b. When seams are required due to color change or field conditions, place adjacent wear surface as soon as possible, before initial pour has cured. Coat edge of initial pour with adhesive and apply wear surface mixture immediately.
      c. Add a minimum of 1/16 inch depth to specified surfacing depth to ensure required impact attenuation performance is met.
      d. Install wear surface to cover foundations and adhere tightly around elements penetrating the surface.

3.06 LOOSE FILL SURFACING

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, and requirements of authorities having jurisdiction (AHJ).

B. Cover Subgrade with Geotextile:
   1. Lap minimum 4 inches width at seams. Adhere seams in accordance with manufacturer's recommendations.
   2. Install smooth, and free of tensile stresses, folds, or wrinkles.
   3. Protect from clogging, tears, or other damage during surfacing installation.
   4. Repair or replace damaged geotextile in accordance with manufacturer's recommendations.

C. Install loose fill to depths indicated, with smooth even surface flush with tops of containment curbs.

D. Sand: Determine finished elevation after sand has been settled with water and percolating.

3.07 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.

B. Repair or replace rejected work until compliance is achieved.

3.08 CLEANING AND PROTECTION

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

E. Protect installed products until Date of Substantial Completion.

F. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric 2011a (Reapproved 2022).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

F. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a (Reapproved 2019).

G. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework 2018 (Reapproved 2022).

H. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures 2018 (Reapproved 2022).

I. CLFMI CLF-FIG0111 - Field Inspection Guide 2014.

J. CLFMI CLF-PM0610 - Product Manual 2017.

K. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing 2018.

1.04 SUBMITTALS

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

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Posts, Rails, and Frames:
   1. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating conforming to ASTM F1043 and ASTM F1083.
   2. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round.

B. Wire Fabric:
   1. ASTM A392 zinc coated steel chain link fabric.

2.02 COMPONENTS

A. Line Posts: As noted on plans.

B. Corner and Terminal Posts: As noted on plans.

C. Gate Posts: As noted on plans.

D. Top and Brace Rail: As noted on plans.

E. Bottom Rail: As noted on plans.

F. Gate Frames: As noted on plans

G. Fabric: 2 inch diamond mesh interwoven wire, 9 gage, 0.1483 inch thick, top selvage knuckle end closed, bottom selvage knuckle end closed.

2.03 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

C. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Mechanical.

2.04 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.05 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.

B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris and finished grade is established.

3.02 INSTALLATION

A. Install framework, fabric, accessories in accordance with ASTM F567.

B. Place fabric on school side of posts and rails.

C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff. Form finish top 12" (minimum) of footing.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

G. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

3.04 FIELD QUALITY CONTROL

A. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

B. Gates: Inspect for level, plumb, and alignment.

C. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.05 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

END OF SECTION

SECTION 323123
PLASTIC FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Plastic pickets.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds 2020.

1.04 SUBMITTALS

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

B. Product Data: Provide data on fence panels, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Fences and Gates:
   1. CertainTeed Corporation: www.certainteed.com/fence/#sle.
   2. Husker Vinyl Inc: www.huskervinyl.com/#sle.
   3. PlyGem: www.plygem.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 PLASTIC FENCES AND GATES

A. PVC Posts, Rails, and Pickets: High-impact, UV-resistant, rigid polyvinyl chloride, complying with ASTM D1784, Class 14344B.
   1. Products:
      a. CertainTeed Corporation; BuffTech Vinyl - Chesterfield with CertaGrain: www.certainteed.com/fence/#sle.
   2. Fence Style: Full privacy.
      a. Fence Height: 6 feet.
      b. Color: To be selected from Manufacturer's full range of standard colors.
      c. Finish: Woodgrain.
   3. Line and Corner Posts: 5 by 5 inches, minimum; 0.135-inch wall thickness, 3/8-inch corner radius.
   4. Rails: 1-1/2 by 5-1/2 inches, minimum; 0.090-inch wall thickness, 5/16-inch corner radius.

5. Pickets: 5/8 by 11-3/8 inches, minimum, tongue and groove; 0.050-inch wall thickness, 1/16-inch corner radius.
6. Post Caps: Match cross section of post; 0.095-inch wall thickness, four-sided configuration.
7. Stiffener Channels: ASTM A36/A36M, galvanized steel with predrilled holes for drainage; sized to fit within PVC rails.

B. Fasteners: Manufacturer's standard stainless steel fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

A. Removal: Obstructions or debris.

B. Ground Preparation:
1. Grading Verify that a consistent grade has been established, with no dips or humps that would impact fence installation.

3.03 INSTALLATION

A. Install framework, pickets, fence panels, accessories and gates in accordance with manufacturer's instructions.

B. Set intermediate and terminal posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Layout: Verify that fence installation markings are accurate, paying attention to underground utilities, and property lines.

3.06 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water; rinse well.

C. Remove mortar from exposed posts and other fencing material.

END OF SECTION

SECTION 329219
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Soil preparation.

B. Seeding, mulching and fertilizer.

C. Erosion Control.

D. Turf establishment.

1.02 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Growing Season: A growing season is considered May 1 to October 1.

C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil or imported topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of grass seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product tags to confirm quantity installed of the following products. Payment will not be approved until product tags have been received and approved by the Architect.
   1. Seed.
   2. Fertilizer.
   3. Fiber Mulch.

D. Qualification Data: For qualified Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact person.
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site
   2. Pesticide Applicator: State licensed, commercial.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and grasses during a calendar year. Submit before expiration of required initial maintenance periods.

F. Establishment Plan. Describing an understanding o fthe required establishment period including anticipated dates for mowing, pest control, observation and overseeding.

1.04 QUALITY ASSURANCE

A. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on Project site when work is in progress.

B. Pre-installation Conference: Schedule a pre-installation meeting to review soil preparation and grading with the Contractor and Architect prior to seeding.

C. Seasonal limitations have been designated below. If seasonal limitations cannot be met, then an alternate soil stabilization practice must be used. Payment will be made to the Contractor for these alternate stabilization practices if caused by the conditions out of the Contractor's control and not the result of the Contractor's negligence or inability to keep the Project on schedule.
   1. Spring: April – June 15
   2. Fall: August 15 –September 15
   3. Dormant: November 1 – Freeze Up

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:
   1. Turf Type Tall Fescue (RTF Varieties) : 90 percent.
   2. Elite Kentucky Bluegrass : 10 percent.

2.02 ACCESSORIES

A. Microbial Inoculant
   1. Inoculate seed prior to planting at rate recommended by manufacturer for seed type specified.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

D. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition
   1. Composition: 18-24-12.
   2. Application rate: 4.0 lb/1000 SF

E. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

F. Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

G. Erosion Fabric: excelsior fibers manufactured from aspen matting, open weave.
   1. Curlex II CL
      American Excelsior Company
      www.curlex.com
   2. Excel SS-2
      Western Excelsior Corporation
      www.westernexcelsior.com
   3. SB150
      North American Green
      www.nagreen.com

4. Equal as approved by SD DOT for Type 2 Erosion Control Blanket.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Seedbed Preparation
   1. Kill existing weed growth with non-selective herbicide a minimum of two weeks prior to planting date. Apply a second application as necessary a minimum of 24 hours prior to seeding or sodding.
      a. Apply at rate recommended by manufacturer.
   2. Loosen soil to a depth of 4-inches.
   3. Remove stones larger than 1-1/2 inches. in any dimension and sticks, roots, trash, and other extraneous matter.
      a. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Pre-emergent herbicide: Prior to seeding, apply pre-emergent herbicide to native grass seed areas.
   1. Apply per manufacturer recommendations.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Apply fertilizer no more than 48 hours prior to seeding.

D. Mix thoroughly into upper 2 inches of topsoil.

3.04 SEEDING

A. Apply seed at a rate of 9 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Hydroseeding is not permitted.

C. Do not seed areas in excess of that which can be mulched on same day.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Roll seeded area with roller not exceeding 112 lbs.

3.05 MULCHING

A. Fiber Mulch: Rate of application shall be 2,000 pounds per acre. Areas of excessive thickness of mulch, which will smother grass seedlings, shall be avoided. Mulch shall be placed on a given area as soon as possible or within 48 hours after seeding as a separate operation. The Contractor shall allow the fiber mulch to cure a minimum of 18 hours prior to watering.

3.06 EROSION CONTROL BLANKET

A. The extent of erosion control blankets shall be as shown on drawings.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Orient erosion control blankets in vertical strips and anchored with staples, at spacing as indicated by manufacturer's written instruction for project application.

D. Provide 12 inch overlap of adjacent rolls, anchor with a common row of staples.

E. Overlap horizontal joints between erosion control blankets sufficiently to accommodate a common row of staples with the uphill end on top of the blanket below.

F. Where exposed to overland sheet flow, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Staple the erosion control blanket to the bottom of the trench. Backfill and compact the trench as required.

G. Secure outside edges and overlaps at 36 inch intervals with stakes.

H. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.07 ESTABLISHMENT

A. Provide maintenance during establishment pioriod at no extra cost to Owner; Owner will pay for water.

B. Begin maintenance immediately after each area is planted and continue until grass is well established and exhibits a vigorous growing condition free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 12-inches by 12-inches, **but not less than 60 days from date of Project Substantial Completion**.
   1. When maintenance period has not elapsed before the end of the growing season, or if turf is not fully established, continue maintenance during next growing season.
   2. Notify the Architect in writing upon the termination of required maintenance services. The Contractor shall continue maintenance services until written notification is provided.

C. Maintain as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Materials and installation methods shall be the same as those used in the original installation.
   1. Fill and establish turf in areas where settling occurs.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards

D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. The contractor is required to mow all seeded turf areas one time. Document and notify the Architect and Owner in writing upon completion.

1. Neatly trim edges and hand clip where necessary.
2. Immediately remove clippings after mowing and trimming.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
   1. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
   2. Broadleaf herbicide application:
      a. Turfgrass: apply a broadleaf herbicide application once turf is established, or as directed by Architect, when grass is dry.

G. Immediately reseed areas that show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

3.08 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION

SECTION 329300
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. New trees.

B. Mulch.

C. Plant establishment.

1.02 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Growing Season: A growing season is considered to be May 1 to October 1.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil or imported topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

1.03 REFERENCE STANDARDS

A. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock 2014.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning) 2017.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Mulch.

B. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to project site.
   2. Pesticide Applicator: State licensed, commercial.

C. Maintenance Agreement: Statement of required maintenance period, duties to be performed, name and contact information of individual responsible for overseeing maintenance services.

D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

E. Statement of Warranty. Describing an understanding of the required warranty. Provide name and phone number for responsible contact.

1.05 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Pre-installation Conference: Schedule a pre-planting meeting to review preparation and planting requirements with the Architect and Contractor prior to planting. All plants, trees and shrubs shall be planted in accordance with all the drawings and specifications included in the plans.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Protect and maintain plant life until planted.
   1. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
   2. Handle planting stock by root ball.
   3. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
   4. Trees may not be stored on site for more than 24 hours prior to planting without prior approval and installation of moisture retaining cover or bedding around all root balls.

1.07 WARRANTY

A. Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship or growth within the specified warranty period.

B. Failures include, but are not limited to: death and unsatisfactory growth, lack of adequate maintenance and damage from falling or blowing over. The Contractor will be responsible to remove all dead plantings and trees immediately upon notification from the Architect, even if the replacement is not immediate. This requirement applies during the warranty period as well.

C. All plants, trees and shrubs shall be **warrantied for ONE YEAR from date of Project Substantial Completion** . At the end of the warranty period the Architect shall make an inspection of the project and dead, unhealthy, or otherwise not acceptable plants, trees, and shrubs shall be replaced by the Contractor at no additional cost to the Owner.
   1. Notify the Owner and Architect in writing immediately upon completion of any warranty replacement plantings. For replacements after the initial establishment period has expired the Contractor shall water replacement plants for one week, after which the Owner assumes responsibility for watering replacement plants. If written notice is not provided the Contractor shall continue to water replacement plants until notice requirements are fulfilled.
   2. An intermediate warranty inspection may occur prior to the one year warranty expiration. Replacement is required within 60 days of the intermediate warranty inspection.
      a. If a plant replaced during the intermediate warranty period dies prior to the final warranty the contractor is not required to install a second replacement without additional compensation. Requests for additional compensation must be approved prior to proceeding with the work.
   3. Notify the Architect in writing with any concerns regarding Owner Maintenance of plant material during the warranty period.

PART 2 PRODUCTS

2.01 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

B. General: All plants, trees and shrubs shall conform to or exceed minimum quality standards as defined by the American Nursery and Landscaping Association, current edition of ANSI Z60.1, and shall be purchased from a licensed Landscape Nursery. Plants, trees and shrubs furnished shall be of the same genus, species, cultivar and size as specified in the plans. Species and variety may be substituted only by the approval of the Landscape Architect. Each plant, tree and shrub shall have an identification label, removed after the Substantial Completion inspection.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.02 MULCH MATERIALS

A. Organic Mulch: Shredded bark mulch.
   1. Color: undyed natural wood.
   2. Particle size and consistency: a general mixture of fibers 3 inches in length or less.
   3. Remove any large mulch chunks that do not meet the requirements above.

2.03 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

C. Pre-Emergent Herbicide: Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

2.04 ACCESSORIES

A. Treegator slow release watering bag, or approved equal; www.treegator.com
   1. Size: 20 Gallon
   2. Supply and install one per tree.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be

planted in the immediate future.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.03 TREE AND SHRUB PLANTING

A. Place plants as indicated.

B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.
   1. Expose root flare; root flare may have been buried in the root ball during growing or tree harvesting operations.

C. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

D. Excavate planting pits with sides sloping inward at a 30-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
   1. Excavate approximately five times as wide as ball diameter.
   2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   3. Hand dig tree planting pits when in close proximity to existing utilities.

E. Set stock plumb and in center of planting pit or trench with **root flare 1 inch above adjacent finish grades**.
   1. Use planting soil for backfill.
   2. Balled and Burlapped: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   3. Container-Grown: Carefully remove root ball from container without damaging root ball or plant.
   4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

G. Set plants vertical.

H. Remove non-biodegradable root containers.

3.04 PLANT SUPPORT

A. Trunk stabilization is not required unless deemed necessary by the Architect to maintain the tree in an upright position. Tree staking may be requested at any time between planting and expiration of the plant warranty period.
   1. Upright Staking and Tying: Use three stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
   2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.05 TREE PRUNING

A. Prune trees as recommended in ANSI A300 Part 1.

B. Prune newly planted trees as required to remove dead, broken, and split branches.

3.06 ESTABLISHMENT

A. Provide maintenance during establishment period at no extra cost to Owner; Owner will pay for water.

B. Maintain plant life for 30 days from date of Project Substantial Completion.
   1. **During the establishment period the Contractor shall be on site a minimum of once per week throughout the maintenance period to monitor trees, water, and weed as necessary.**
   2. When maintenance period has not elapsed before the end of the growing season continue maintenance during the next growing season.
   3. Notify the Architect in writing upon termination of the required maintenance services. The Contractor shall continue maintenance services until written notification is provided.

C. Irrigate sufficiently to saturate root system and prevent soil from drying out.

D. Remove dead or broken branches and treat pruned areas or other wounds.

E. Neatly trim plants where necessary.

F. Immediately remove clippings after trimming.

G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

H. Control insect damage and disease. Apply pesticides in accordance with manufacturers instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

I. Remedy damage from use of herbicides and pesticides.

J. Replace mulch when deteriorated or displaced.

K. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION